New Zealand JOURNAL of AGRICULTURE

JULY 1946

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The Third Horseman: FAMINE

. . . and lo a black horse; and he that sat on him had a pair of balances in his hand. And I heard a voice . . . say, A measure of wheat for a penny . . .

REVELATION VI : 5, 6.

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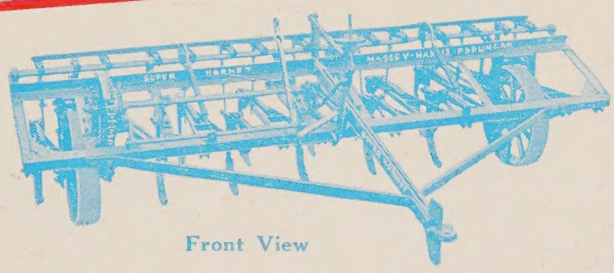
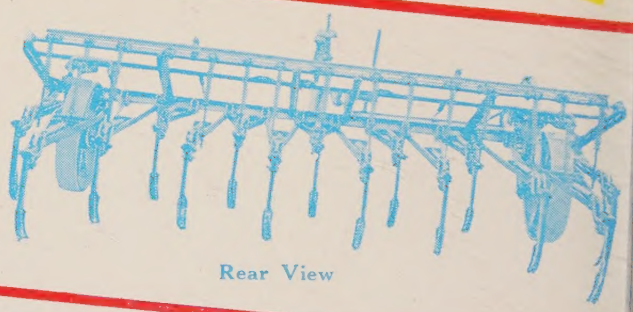


Front View



Rear View

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Fertilisers

HISTORY OF SUPPLIES IN WAR AND PEACE

By G. H. HOLFORD, *Superintendent of Fertilisers, Wellington.*

"CAN it be doubted that of all problems that should preoccupy mankind, that of the fertility of the earth is of the most fundamental importance?" asks a leading British scientist. As food is fabricated soil fertility, and the world food crisis is probably post-war problem number one, at no time in history have so many people been so deeply concerned with edible products made possible only by soil fertility.

THOUGH it is true that over wide areas of the earth food is produced without the aid of applied fertilisers, it is no less true that for many years their use has played a significant role in food production in many countries. This applies with special emphasis to New Zealand. In some of our highest-producing areas, notably the Waikato, the use of fertilisers has played a major role in bringing about their present production.

Pasture topdressing, which has developed rapidly in the Dominion during the present century, has been a significant factor in the rise of the dairying and fat lamb industries. Topographic and economic handicaps have limited fertiliser applications on much of the hill country, but even there considerable tonnages have been used. Under modern farming conditions, manuring of crops has for years been an established and profitable practice in New Zealand arable farming.

An evaluation of the important part played by fertilisers in the Dominion's farm economy has not yet been made, nor will it be attempted here. In America a recent survey indicated that there 1 dollar spent on fertiliser returned on the average 3 dollars in farm products. With New Zealand's on the whole more favourable climate, a survey here would be likely to reveal even better returns.

The Dominion's fertiliser supplies are undoubtedly of vital interest to the farming community, and factors which limit those supplies are of no less concern. The purpose of this article is to discuss the main features of the New Zealand fertiliser position during World War I, during the years up to 1939, and during World War II. In subsequent articles consideration will be given to new fertilisers made available in recent years, notably serpentine superphosphate, and to possible future trends in fertiliser manufacture and use. The use of lime will also be discussed.

WORLD WAR I

Phosphate Supplies

As all but a small percentage of the fertilisers used in New Zealand are phosphatic, supplies of this type are of paramount interest. Unfortunately, because of lack of domestic deposits (with one exception), we are dependent on overseas sources, which makes our fertiliser industry vulnerable in time of war. Though the first importation of phosphates took place in the sixties of last century, it was not till 1913 that imports reached 100,000 tons.

In contrast to the position during World War II, imports of phosphatic fertilisers were well maintained from 1914 to 1918. In that period only two superphosphate works were operating in the Dominion, with a capacity insufficient to supply domestic requirements. The average annual imports of rock phosphate for that period were 29,000 tons, sufficient to manufacture 46,000 tons of superphosphate. Imports of this fertiliser, mostly from Australia and Japan, averaged 44,000 tons a year. Other phosphate supplies in the years 1914 to 1918 averaged yearly: Basic slag 15,000 tons, bonedust 8,000 tons, Egyptian phosphate 4,000 tons, and Clarendon (N.Z.) phosphate 6,000 tons.

As the war progressed imports of basic slag fell to negligible quantities, and supplies of superphosphate and Egyptian phosphate (brought by returning troopships)

increased. The 1918 phosphate imports were nearly 100,000 tons—the same as for 1913.

Beyond halting the natural annual increase (between 1910 and 1914 phosphate imports doubled), World War I did not seriously affect the Dominion's phosphate supplies, except to increase their cost materially.

No fertiliser rationing scheme was introduced. In 1914 the proportion of phosphate used as topdressing was roughly 40 per cent.; in 1939 it was over 80 per cent.

Other Fertilisers

Potassic.—In 1914 some 4,500 tons of potassic manures were imported (2,300 tons of kainit, 1,100 tons of sulphate of potash, and 1,100 tons of 30 per cent. potash salts—all of German origin). Imports decreased slightly in 1915 and practically ceased in 1916 till after the war.

Nitrogenous.—Sulphate of ammonia imported during the war averaged less than 500 tons a year. This was used mostly on orchards and market garden crops. Limited quantities of nitrate of soda—used in superphosphate manufacture and for garden crops—came in from 1914 to 1918.

Organic fertilisers.—Blood and bone, and bonedust, the fertiliser byproducts of our meat industry, were available during the war in a tonnage of some 15,000 annually.

Summarising, during World War I supplies of phosphatic fertilisers were well maintained—at 100,000 tons annually—and the limited use made of potassic and nitrogenous fertilisers at that time meant that lessened imports were not of serious moment in the fertiliser programme. Some 60 per cent. of the quantities available was used in crop manuring, mostly for root and forage crops; only a small percentage of cereal crops was manured. Topdressing of grassland was then practised mainly in the South Auckland and Taranaki districts.

The number of stock carried on Dominion farms increased during the war and cropping was well maintained.

BETWEEN THE WARS

Phosphate Supplies

Imports of phosphates averaged 80,000 tons from 1919 to 1922. The annual shortage of 20,000 tons compared with the war years was caused mainly by lack of shipping. A 50 per cent. increase—to 126,000 tons—occurred in 1923, and tonnages increased each year up to 1929. In 1922, with the operation of a third factory, the Dominion became self-supporting in superphosphate manufacture. At that time the Department of Agriculture began a widespread series of experiments which during the next few years demonstrated the increased yields secured by fertiliser applications on crops and grassland. Publicity given to these results, and a fertiliser price "war" which for a period lowered the sale price of superphosphate in the North Island, were important factors that in the next few years rapidly increased the tonnage used, especially on the grasslands of the Dominion. Between 1923 and 1929 phosphate imports showed a remarkable increase from 126,000 tons to 339,000 tons.

The serious decline in prices for farm products caused a marked recession in phosphate imports from 1930 to 1935, when they averaged only 240,000 tons. They were stepped up to 310,000 tons in 1936 and to 404,000 tons the next year, with a slight falling off in 1938 to 371,000 tons. These figures include rock phosphate for superphosphate manufacture, and what may be termed "other" phosphates—basic slag, North African phosphate, and guano—imported in a form suitable for farm application without grinding or processing.

At one time "other" phosphates were imported in considerable quantities. For instance, during the years 1928-1932 the tonnage of superphosphate manufactured averaged 250,000 tons and imports of "other" phosphates 139,000 tons. In the main depression years 1932-1935 superphosphate manufacture averaged 270,000 tons and imports of "other" phosphate only 50,000 tons. From 1936 to 1938 the yearly superphosphate tonnage reached 370,000 with "other" phosphates averaging 103,000 tons.

Superphosphate manufacture totalled 400,000 tons for the first time in 1938, going still higher (to 435,000 tons) in 1939. "Other" phosphates were more than 100,000 tons in both these years.

With 4 tons of superphosphate used for 1 ton of "other" fertilisers, the period between wars was one of expanding phosphate imports except during the depression years and just before World War II. In this period the number of superphosphate works was increased to eight, the number still operating.

Other Imports

Potassic.—Potash fertilisers, which were cut off in the war years, began to come in during 1920. From that year to 1936 imports fluctuated between 5,000 and 10,000 tons annually. Between 1937 and 1939 they rose steeply to an annual average of 16,000 tons, and 90 per cent. of this was as 30 per cent. potash salts, used mainly on grassland in certain districts which were found by experiments to respond to potash manuring.

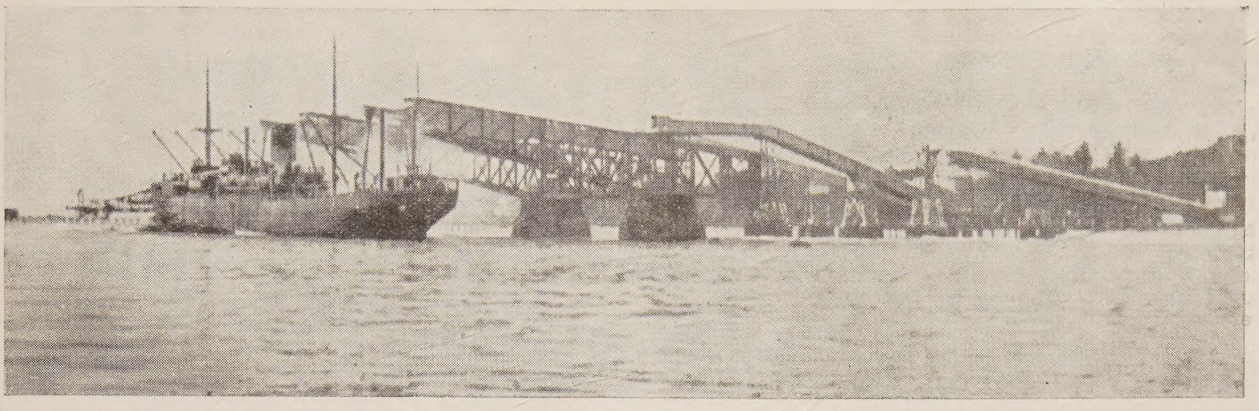
Nitrogenous.—Sulphate of ammonia imports first exceeded 1,000 tons in 1926; they rose to 2,000 tons in 1928, and in 1929 jumped to 9,000 tons. This was caused by the importation of the cheaper synthetic forms of this fertiliser, and its use was stimulated by the application of sulphate of ammonia as a pasture topdressing in the then new intensive grassland management campaign. In the main it was applied as ammoniated superphosphate made up of 2 parts of superphosphate and 1 part of sulphate of ammonia. Imports of sulphate of ammonia averaged 5,000 tons a year from 1931 to 1939. Except for limited use on garden crops, nitrate of soda was used in superphosphate manufacture. From 1918 to 1939 imports averaged between 1,000 and 2,000 tons annually.

Phosphate deposits at Nauru Island.

WORLD WAR II

Phosphate Supplies

In 1939 phosphate imports had reached their highest figure of 463,000



Loading from the cantiliver at Nauru Island. This equipment was considerably damaged by enemy action in the recent war, but is now being restored.

tons, of which 351,000 tons was rock phosphate used for the manufacture of approximately 560,000 tons of superphosphate. In that year imports of basic slag were 40,000 tons, North African phosphate 44,000 tons, and guano 28,000 tons. With home-produced fertilisers such as bonedust and blood and bone, the total tonnage of phosphatic materials available approximated 700,000 tons, but some 80,000 tons of rock was held in reserve and has been gradually used over the rationing years.

While in 1940 our imports of rock phosphate were only 5,000 tons less than in 1939, the figures for basic slag fell to 8,500 tons, for North African phosphate to 26,000 tons, and for guano to 24,000 tons. The overall tonnage of phosphate imports was 405,000, some 58,000 tons lower than in 1939.

In December, 1940, German sea raiders sank five phosphate-carrying ships in the vicinity of Nauru Island and damaged loading installations on the island. In the following year the total phosphate imports dropped to 303,000 tons, and it was nearly all rock phosphate, as the "other" phosphates such as basic slag could not be imported.

Japan's entry into the war in December, 1941, soon completely shut off supplies of phosphate from Nauru and Ocean Islands, which in 1939 had supplied nearly 1,250,000 tons, nearly all to Australia and New Zealand. During the early months of 1942 steps were taken to evacuate personnel from Nauru and Ocean Islands, which were occupied by the Japanese in August, 1942, and for the following three years. Unfortunately, because of the destruction wrought by the occupying forces and by Allied bombing, it will be several years before the 1939 volume of phosphate exports can be secured from these islands.

In 1942 rock phosphate imports were 137,000 tons—about one third of those in 1940—and, all things considered, it was fortunate that they were not even lower. Had the Japanese not been stopped in their Pacific Ocean offensive, it is certain that the island from which most of our phosphates have been received from 1942 onwards—Makatea Island, in the Tuamotu Archipelago, some 130 miles from Tahiti—would have been as effectively cut off as were Nauru and Ocean Islands.

Unfortunately shipping shortages and the loading facilities at Makatea have restricted the volume of this high-grade phosphate reaching New Zealand. Though Makatea has been our main supply source, substantial tonnages have been obtained from North Africa and the United States. The average phosphate content of the rock from these three sources has been some 8 per cent. less than that from Nauru and Ocean Islands.

Still Below 1939

The tonnage received in 1943 was no greater than in 1942—less than 140,000—but the figure rose to 193,000 tons in 1944 and to 241,000 in 1945; the imports for 12 months July, 1945, to June, 1946, were about 300,000 tons. This figure would be 50,000 tons less rock phosphate than was received in 1939, and in terms of superphosphate 80,000 tons less. Then there is the shortage of more than 100,000 tons of "other" phosphates such as basic slag, North African ground phosphate, and guano, making our over-all supplies of phosphatic fertiliser 180,000 tons less than in 1939.

Comparing the two war periods, it can be seen that in 1914-18 phosphate tonnages were well maintained, in marked contrast to the 1939-45 years.

At the outbreak of the Second World War New Zealand's phosphate supplies were more than five times those of 1914. The task of securing supplies after Japan became an enemy, and with restricted shipping available, was very difficult. The splendid work of the British Phosphate Commission, with its first-class personnel and wide experience, in securing the substantial tonnages that reached our shores during the war years is worthy of special mention. The commission can also be relied on to spare no effort in the still difficult task of obtaining for New Zealand the maximum tonnages of phosphates possible in the post-war years, and in particular in again establishing full supplies from Nauru and Ocean Islands.

Domestic Sources

When New Zealand was faced with lessened imports of phosphates, steps were taken by the Government to investigate domestic deposits. Despite an intensive search, the only one of moment yet discovered is that at Clarendon, some 30 miles south of Dunedin. From this area some 137,000 tons were used between 1903 and 1926, after which increasing and cheapening imports caused the cessation of activities.

During the recent war further supplies have been obtained from Clarendon. The British Phosphate Commission secured some 7,500 tons of the higher-grade phosphate rock, which has been used in superphosphate manufacture. This operation ceased only when the known deposit of the higher-grade rock in the area became exhausted. Geological examinations during the war revealed deposits of lower-grade phosphatic material at Clarendon which had not previously been used. Steps were taken to open them up, and more than 22,000 tons of ground phosphatic material averaging 10 to 12 per cent. phosphoric acid was made available during the recent war. Operations with this material are still continuing on a limited scale. It is being applied mostly in fertiliser mixtures sown with root crops in Otago and Southland.

Fertiliser Rationing

The declining phosphate supply in 1941 brought about a rationing scheme

Mrs. G.M.M. (ex W.R.N.S., Windsor), wife of Sq. Leader F.M. (D.F.C.)

Mrs. M.G.B., wife of Flying Officer E.N.B. (R.N.Z.A.F.)

"HOME" WAS NEVER LIKE THIS...

say newly arrived English Brides in New Zealand

I ARRIVED in New Zealand a few months ago and I still can't get used to the amount of good food everywhere.

It was as if I was transported back to pre-war days at Home. The shop windows crammed with good things, things we hadn't seen for years; the restaurants, where one could get a meal far beyond the resources of a war-time English wife—it was a wonderful feeling to experience.

I was scared to ask for eggs, steaks, chops, etc., especially eggs, surrounded with shell, not tin. But underneath my delight was the sobering thought —how I wish I could send enough of these good things Home to take the monotony and frugality from the diet of my people in England.

The same food—always the same food, unvarying and so little. It preys on a woman's mind. (Mrs. G.M.M.)

SINCE my arrival in New Zealand, land of plenty, compared with Britain, I have come to the conclusion that many people here do not fully realise what rationing in foodstuffs has meant to the average folk back home. It's no easy problem dividing butter, an amount roughly the size of a matchbox, maybe a little thicker, into pats sufficient to last a week. In one respect we were lucky in having palatable margarine, without which we could not have pulled through as we did. And as for frying fish or your solitary egg, what can you do with a piece of lard the size of a walnut that has to last you a week?

Now that all lease-lend supplies have stopped—during the war we had dried eggs, milk and spam—the housewife's task of providing food for her family has become increasingly difficult. Puddings and "sweets" are almost a thing of the past; the ingredients are unprocurable and butter, milk, sugar, etc., in the majority of cases cannot be spared.

So you see how difficult it really is for the British housewife to cater for young and old alike. (Mrs. M.G.B.)

save food

FOR BRITAIN

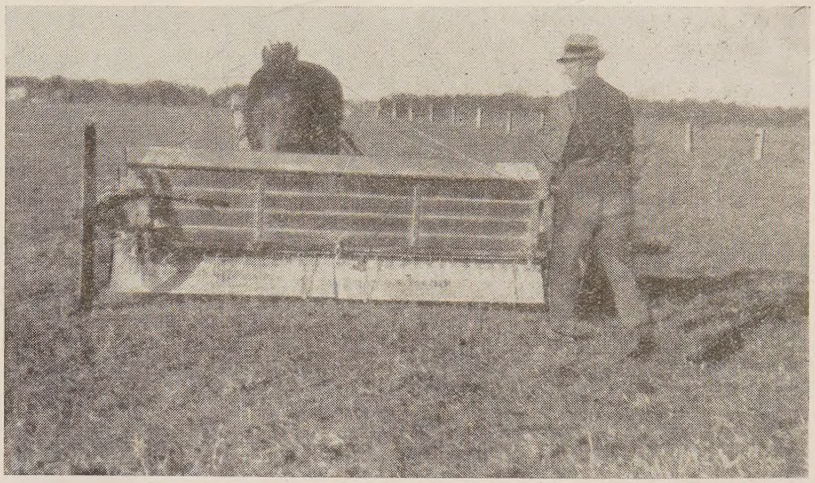
FEC 25.24

for phosphatic fertilisers as from July 1, 1941. The scheme adopted was based on recommendations of the National Council of Primary Production and administered by the Department of Agriculture. Its main features were the setting-up of a schedule of per acre allowances of phosphatic manures for crops and permitting their use on grassland on the basis of a percentage of previous usage.

Cropping.—Important considerations underlying the scheme adopted were these:—Over wide areas certain crops, such as turnips and swedes, could not be grown successfully without the aid of some fertiliser. The expenses an acre in crop production are such that poor returns from unfertilised areas would tend to lower both the yields and in time the acreage devoted to crops deemed essential in our wartime economy. The allowance an acre for scheduled crops was generally less than that normally applied in pre-war years. The principal farm crops —cereals, roots, and forage—were allowed quantities ranging from 1 to 2cwt. of superphosphate an acre. Potatoes, carrots, and maize received 3cwt., tobacco 5cwt., and hops 4cwt. For onions and market garden crops 10cwt. an acre were granted. In the recent rationing years slightly larger quantities were allowed for wheat and for root and forage crops. Between a quarter and a third of the total phosphate supplies went for crop requirements under wartime rationing.

Topdressing.—The rationing basis for topdressing grassland was a percentage of the average quantity a farmer had used for the two years ended May 31, 1941. This was the period in which New Zealand farmers had applied the greatest quantity of fertilisers for topdressing. For the first rationing year—July, 1941, to June, 1942—40 per cent. of the average purchases of the two base years was allowed. The smaller quantity available in 1942-43 brought the percentage down to 28, and it remained at that figure for the following year. Increased phosphate supplies allowed an extra ration for topdressing, but because of the need for more dairy products the extra allowance was granted on the basis of 1cwt. of superphosphate or its equivalent for each dairy cow milked, and this absorbed about 84,000 tons of superphosphate or its equivalent.

In the past rationing year—July, 1945, to June, 1946—the extra allowance for cows milked was discontinued, but the percentage for topdressing was increased from 28 to 42 of the base years. From time to time some measure of control has been exercised over the use of nitrogenous and potassic fertilisers; organic fertilisers have in the main been directed to market gardens and orchards as a first priority, then for mixing purposes for crop manuring.



Topdressing dairy pasture.

Comments on Scheme

What success can be credited to the rationing scheme is in the main attributable to the splendid co-operation of the manufacturers, merchants, and farmer users with the administering authorities, and to the particular services given generously by the members of the fertiliser committees, set up under the District Councils of Primary Production. Under any rationing scheme there are bound to be hardships and anomalies for a number of reasons. So that these could be considered, and where possible adjusted, provision was made for farmers to lodge appeals. It was the task of the fertiliser committees to consider the facts submitted by all appellants and to recommend, where they thought fit, additional fertiliser allowances. Dealing with thousands of appeals has meant a very great amount of work by committeemen and others who for several years have given invaluable voluntary service so that the maximum of equity, consistent with the need for high farm production, could be maintained in fertiliser distribution.

It is not considered that the scheme adopted in New Zealand or any scheme, even when justifiable appeals have been satisfied, could be wholly satisfactory in its equity to every individual. Fertility of soil, fertiliser requirements of crops and grassland under various types of farming, and many other factors will hardly be strictly comparable on any two farms in the country.

Dr. E. M. Crowther, a noted British authority on fertilisers, commenting on the British rationing scheme, says: "Rationing of fertilisers aims at efficient production and not at some abstract principle of equity."

The fact that the over-all production from New Zealand farms was higher during the five years of war than in the previous five years, despite labour and fertiliser shortages, is at once a tribute to the farming community and a suggestion that the way in which our lessened quantity of fertiliser has been used has contributed to efficient production during World War II.

Farmers' Criticism

Though our over-all farm production during the war was so satisfactory, it is inevitable that in farming, as in other callings, burdens have fallen unevenly in different districts and on different farms during the post-war period. A few farmers have felt a sense of injustice at the quantity of fertilisers they have secured under rationing.

There has been criticism of the manurial allowance for different crops, and in particular of the quantity being the same per acre in different parts of the country. No administratively feasible scheme would make available differential allowances for land which often could vary on one farm as well as in different districts.

The fact that farmers who had used most fertiliser for topdressing in the two base years, June, 1939, to May, 1941, secured the most under rationing was the central point of most criticism. Generally the farmer who was carrying out a heavy topdressing programme was also maintaining a relatively high stock-carrying capacity. National considerations required maximum farm production, and sound technical reasons can be given for continuing with fertiliser use even on a smaller scale on high-producing farms, rather than applying limited quantities to pastures inadequately

topdressed in previous years. Experience has shown that it is possible to maintain a relatively high production from pastures with limited phosphate applications—at least for a year or two—where substantial topdressing applications have previously been made.

An allowance of 28 per cent. of previous usage would give more production on such areas than would the same quantity applied to pastures previously receiving limited phosphate. As a good percentage of phosphate applied goes to satisfy the soil hunger for phosphate before plants can secure a quantity for their growth, light applications on lightly-phosphated or untopdressed areas would be largely wasted. Hence it was not possible to bring in new areas of certain types of land for farming during the war. (In bringing in new pumice land before the war it was common practice to apply up to 9cwt. of superphosphate an acre in the first year—3cwt. when sowing down in the autumn, 3cwt. in the following spring, and 3cwt. in the next autumn. This provided a good sole of grass of high carrying capacity, and after that yearly applications of 2 to 3cwt. an acre sufficed to maintain production).

The one way to get the least production from the smaller tonnage of phosphate available for topdressing grassland since rationing began would have been to have applied it equally over all the grazing areas of the Dominion. The few pounds of superphosphate an acre would have given little effect anywhere.

It is hoped that within a year or two supplies of phosphate will satisfy all farmers' requirements and allow for a good programme of land development without rationing.

The securing of adequate imports of fertilisers will not solve all problems relating to farmers' fertiliser requirements. For a number of years the transporting of heavy tonnages, especially at peak periods of demand, from works to farmers' stations has been a major difficulty. During the last two years motor transport from works to farms, also sea transport, has been used as an auxiliary to rail, but even with these aids it has not been possible to meet the problem satisfactorily. The transport difficulty is one that must be resolved if our fertiliser position is to show the improvement desired in the next few years and when the call will be for increased supplies—even above those of 1939.

CONTRASTS IN PRICES

Increases During 1914-18

In 1914 superphosphate 36/38 per cent. sold at £4 10s. to £4 15s. a ton ex store. Japanese superphosphate 42 per cent. grade sold at £4 12s. 6d. to £4 15s. a ton. As the war progressed prices rose year by year, and when the war ended 36/38 per cent. superphosphate was selling retail at £8 10s. a ton. (By 1920 the price was £10 10s., and some shipments of Japanese superphosphate in that year cost £13 c.i.f.e. New Zealand ports).

The grade of superphosphate made in New Zealand and imported from Australia was 36/38 per cent. in World War I and up to 1924. Since then the New Zealand grade has been 44/46 per cent. This allowance must be made in comparing prices before and after 1924.

Prices of basic slag closely parallelled those for superphosphate in 1914 and 1918, and bonedust rose from £8 to £14 between the beginning and end of the war.

Sulphate and muriate of potash, which sold at £18 a ton ex store in 1914, rose to £45 by the end of the war, but as supplies were then unprocurable this was really a nominal figure.

Sulphate of ammonia rose from £18 10s. a ton ex store in 1914 to over £40 a ton in 1918.

Organic fertilisers doubled in price during the war, and in 1920 blood and bone was sold at over £20 a ton. Bonedust selling at £8 10s. a ton in 1914 brought £18 in 1918.

Stabilisation in World War II

The price to farmers of the main phosphatic fertiliser—superphosphate—has remained practically constant since 1939. Under the stabilisation policy the additional costs of raw material and manufacture were not reflected in prices paid by farmers, and in possibly no other country have superphosphate prices remained as at the outbreak of war—£4 a ton in the North Island and £4 4s. in the South, where free delivery points mainly account for the extra 4s. a ton. Without this arrangement the price of superphosphate would probably be over £10 a ton today.

When war broke out basic slag was selling at over £8 a ton and North African phosphate and guano at £1 10s. to £2 a ton more than superphosphate. For a short period early in the war a subsidy of 7s. 6d. a ton was paid on these fertilisers. Since that period no supplies of these fertilisers have reached New Zealand.

The prices of potassic and imported nitrogenous fertilisers have also been stabilised. The principal potassic fertiliser—muriate of potash—today sells at £28 10s. a ton, and sulphate of ammonia at £23 5s. a ton ex store.

The prices of organic fertilisers have been controlled and there has been little advance. The ruling prices, varying with analysis, range as follows:—Bonedust, £9 to £13; blood and bone, £8 to £10 a ton.

Summary

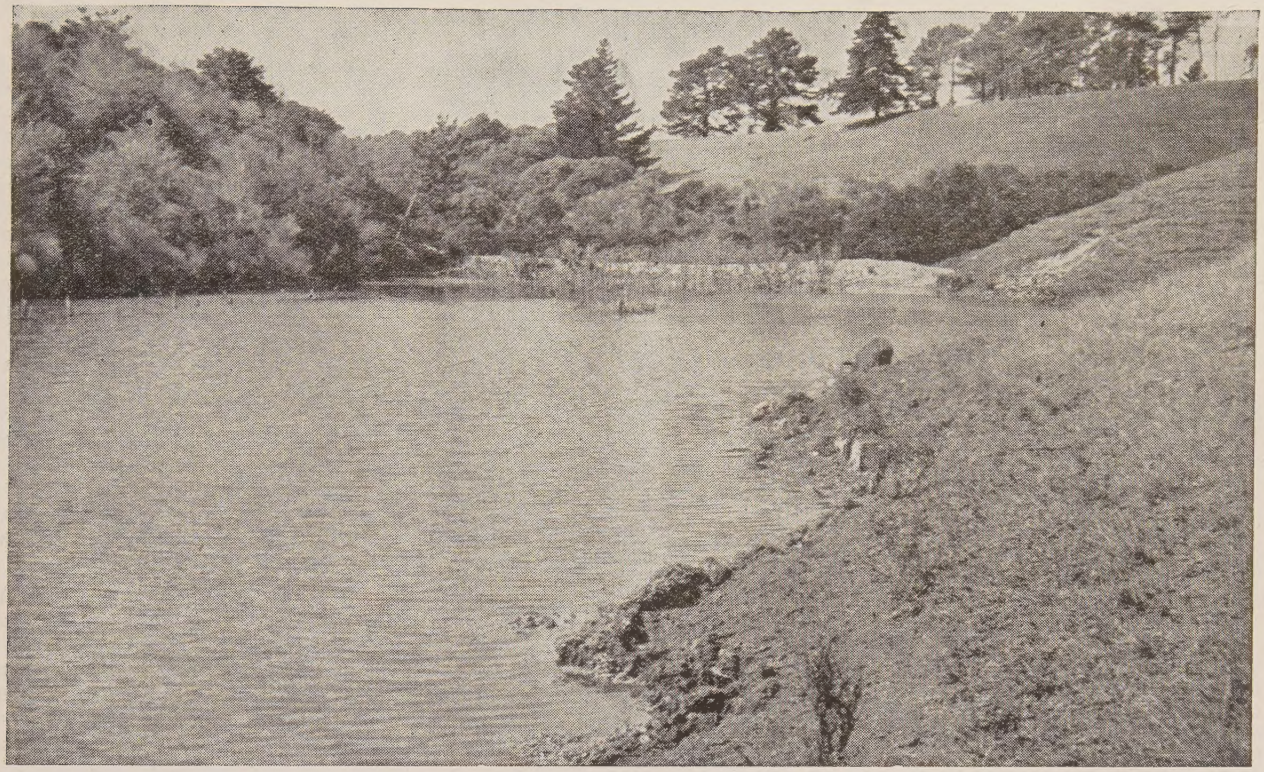
Since the turn of the century the increasing use of fertilisers has played a most important role in the Dominion's agricultural progress. Usage of phosphate, our main fertiliser requirement, which is nearly all imported, reached 100,000 tons in 1913. This tonnage was fairly well maintained during World War I.

The quantity available fell by 20 per cent. in the immediate post-war period. Apart from a recession during the years 1930-33, the tonnage rose rapidly till 1939, when the amount available for farm use approached 700,000 tons. The loss of Nauru and Ocean Islands rock phosphate supplies caused a substantial reduction in tonnages available in 1942 and 1943, when only one-third the quantity of phosphatic fertilisers was available for farm use, but tonnages increased in the two following years, and in 1945 two-thirds of requirements as measured by the 1939 figures were available.

Supplies of phosphatic fertilisers—superphosphate and "other" phosphates—were some 180,000 tons less in July, 1946, than in 1939. During World War I supplies of imported potassic and nitrogenous fertilisers fell to negligible quantities. Their use increased substantially between the two wars and were limited to essential requirements during World War II. There was no fertiliser rationing scheme during the 1914-18 war, but in 1941 a phosphate rationing scheme was introduced and is still in operation. This was based on a per acre allowance for crops and a percentage allocation of previous usage for topdressing grassland.

It is significant that despite the lessened tonnage of fertiliser used in New Zealand since 1941, the production of livestock and cash crops showed an increase for the six war years compared to the five-year period 1934-39, which so far as the influence of fertiliser on production is concerned suggests that its use under the rationing scheme was on a satisfactory basis.

During World War I and the immediate post-war years prices of fertilisers rose considerably. They were stabilised for superphosphate on the 1939 prices and for potassic and nitrogenous fertilisers on the 1942 prices over the period of World War II and these prices are still maintained.



A NOVEL FARM WATER SUPPLY

WHERE no good natural supply is available the search for water and the tapping of it may involve a farmer in unpredictable expense, especially on limestone country. How a Wharehine, Rodney County, farmer obviated risking a sizeable sum and yet secured a practically inexhaustible supply of water for his stock is described in this article by P. S. Syme, Instructor in Agriculture, Warkworth.

IN different parts of the country the water problem may be tackled in different ways according to circumstances. Where no good natural supply is available a plentiful supply can sometimes be obtained by boring. Unfortunately, the result and cost of boring may often be quite unpredictable, and the operation then becomes purely a gamble with a sizeable sum of money at stake.

Many people pin their faith on the services of some reputed "diviner," whose "art" has long been the subject of controversy; but professional borers will point out that on "good water country" a trustworthy water-bearing stratum may extend over hundreds of square miles, and that to obtain water it is only necessary to penetrate this stratum, and the best site for the bore is dictated mainly by convenience. For this reason a skilled professional will have no hesitation in boring almost anywhere on familiar country where previous experience has already pin-pointed a number of successful bores.

One fact clearly established is that, with or without the help of a diviner, the dice is loaded against the farmer who proposes to bore in limestone country. Limestone can be as impervious as concrete, the stratum may extend over a very wide area, and may be of considerable thickness. Even should a determined effort succeed in penetrating through the limestone, the bore is just as likely to encounter an impermeable clay as the much-desired water-bearing gravel or sand.

With the experience of repeated local failures to guide him, Mr. J. S. Beaver, of Wharehine, decided that he would not risk money in searching for water by boring, no matter how desperate his need. His farm overlies an extensive formation of limestone, and the water supply problem in summer was invariably an acute one, so something had to be done. After careful deliberation he decided that the wisest policy would be to excavate a reservoir or construct a dam. Unfortunately, excavating limestone is expensive, and there appeared to be few convenient sites for a dam. The problem, which promised to be a difficult one, was presently solved in a very simple and effective way: not by excavating earth to form a reservoir, but by draining off salt water and forming a freshwater pond.

The drought experienced during the past season has emphasised the importance of a trustworthy farm water supply. To be short of feed is to be unfortunate; to be short of both feed and water in a dry season may be catastrophic.

Tidal Creek for Dam

A narrow tidal creek running in towards the centre of his farm was eventually selected as a convenient dam site. This creek provided a

Above—View of miniature lake formed by dam. Although shown at the peak of the drought period, there is obviously still no shortage of water.

View of spillway. Note how the mangroves have been killed by the fresh water.

natural catchment area which would ensure a plentiful supply of water. The problem merely entailed the replacing of the salt water with fresh water, and in reality proved to be quite simple and not so very expensive.

Power Beats Muscle

The work of damming the creek was started by shovel banking from the bed of the creek itself. Adjacent limestone was then wheel-barrowed to the embankment to provide a foundation firm enough to permit the use of a horse scoop. The horse scoop method proved a slow and laborious job, and even when finished the embankment was not strong enough to withstand floods. Eventually the work was completed by a bulldozer in 18½ hours at a cost of £2 12s. 6d. per hour. Mr. Beaver estimates that much time and labour could have been saved if a bulldozer had been employed from the start, when the complete job could have been done at a cost of about £70.

The embankment is 22ft. wide at the base, narrowing to 13ft. at the top, and is 10ft. high by 44 yards long. At the beginning of the work a length of 8in. steel pipe was laid in at the base to drain off the salt water. The pipe was plugged to prevent salt water from entering at high tide and the plug was removed occasionally at low tide to allow any traces of the original salt water to drain away. Once all the salt water had been drained off and the dam had been completed, the plug was permanently inserted.

Important Safety Factors

In designing the embankment Mr. Beaver kept in mind the large size of the catchment area, and avoided the two serious mistakes which have so often proved the ruin of a dam. He allowed for plenty of width to resist the hydraulic pressure, and provided an overflow channel of generous capacity, sufficient to cope with the heaviest of floods and still leave a good margin of safety.

The miniature lake formed by the embankment is about 150 yards long by 40 yards wide and 5ft. deep, and provides a storage capacity of approximately 1,687,500 gallons. For a total of, say, 90 head of stock this would provide sufficient water to cope with about 3½ years of continuous drought, and, even allowing for evaporation, this would seem, in Mr. Beaver's words, to provide an adequate insurance!

After the plugging of the outlet pipe the dam filled up very quickly with the first rains and has provided a satisfactory water supply ever since. Even though well tested in the recent drought, no anxiety was felt about the water holding out. The cows might go hungry, but they need never be thirsty.

An advantage of this type of dam which will appeal to many farmers is the ease with which it can be drained and then flooded with salt water should it ever become necessary to kill raupo or other aquatic weeds which are so apt to prove troublesome in a fresh-water pond.

Mr. Beaver has solved his water supply problem ingeniously and cheaply, and has at the same time converted what was previously a drab, muddy creek into an attractive miniature lake which greatly improves the amenities and appearance of the farm.

Close-up of embankment showing generous size of spillway. The embankment also provides a convenient roadway connecting two sections of the farm.

PIG RECORDING

PIG recording has been defined as a process of finding animals whose progeny are capable of producing and continuing to produce in a given time a maximum amount of pig meat of the best quality at a minimum of cost. This capacity to produce depends upon and is measured by the number of litters reared by a sow in a given time, the number of pigs in a litter, the weight of piglets at birth, the mothering capacity of the sow, the mortality rate of the pigs, the growing capacity of the survivors, the efficient utilisation of feed supply, the fattening capacity, and the quality of meat and fat. Man's assistance plays a big part in all these factors, which are discussed in this article.

AS explained above in the definition, pig recording aims at ensuring the continued inheritance of good performance, and this depends largely on the constitution and general make-up of the animal. This is difficult to measure, and can be done largely by judging the external characters of the animal and partly by delayed selection and breeding from old animals whose progeny have proved their worth to the second, third, and fourth generations.

Three Objectives

To sum up, pig recording achieves three objectives—first, the finding of better animals; second, the setting up of standards of performance that may be used as commercial yardsticks by producers for measuring up the performance of their stock, and, third, the supplying of information about conditions under which the best cash returns are obtainable.

The first objective is achieved only when the conditions under which maximum production is possible are understood and practised. The actual procedure followed differs from country to country. In Denmark conformation and type are supervised at breeding centres which cater for foundation stock; feeding performance and carcass quality are tested at testing stations. In Sweden, Canada, and England litters are tested and carcass quality evaluated in slightly different ways. In New Zealand the Waikato and Manawatu pig recording clubs tested litters and conducted feeding trials over a number of years on commercial and pedigree pig farms.

The Department of Agriculture established a pedigree sow recording scheme in 1936, and a carcass evaluation scheme in 1937, which makes pedigree sow recording complete. In addition a pig census was introduced in 1938, and from this valuable information has been obtained relative to management and cost of production. In this article the information collected by pig recording clubs is set

out to show what pigs are capable of producing by way of litters, growth rate, etc., and what use can be made of feed under ordinary farm conditions.

Results Obtained

The general observation that care on the part of the owner is all important may be substantiated by details which demonstrate this fact to those who doubt its authenticity, and should correct wrong impressions that anyone may have gathered from observation of one or two of his own sows.

For example, it must have been generally remarked how well a litter, whatever the size, sometimes grows and at other times how badly, in spite of the care bestowed. Many have formed the opinion that sows are best left to themselves. This is the tragedy of present-day pig production, which a perusal of the following table shows:

TABLE 1—PRODUCTION OF SOWS.

	1932-36.
Number of litters	468
Averages of—	
Number born	9.3
Number weaned	7.2
Percentage mortality	22.2
Weight, litter at three weeks (lb.) ..	75.6
Weight per piglet (lb.)	10.3
Weight, litter at eight weeks (lb.) ..	240
Weight per piglet (lb.)	33.4

This table shows what average sows are capable of producing. The loss is most striking. The causes of death were specially noted for 371 pigs. They are as follows: Overlain, 187; born dead, 104; died at birth, 40; runts, 26; other causes, 14.

It is well known that many pigs die between birth and weaning. This shows how many, and puts the percentage at about 20 to 25, half being overlain, chiefly because of clumsy overfat or irritated sows unaccustomed to their surroundings. This loss is preventable by consideration on the part of the owner, and, if eliminated, would result in a real source of profit.

Variations Observed

The following table shows the variation that occurs in production, the good results arising from careful owner attention, and the disasters associated with neglect. It has been established beyond question that more than 90 per cent. of this variation is due to the amount of care given by the owner. Nearly every sow is capable of doing as well as the average; 80 per cent. can, with the assistance of the owner, do as well as the best!

TABLE 2—VARIATIONS IN SOW PRODUCTION.

	Highest.	Lowest.
	lb.	lb.
Litter weight at three weeks ..	199.0	33.0
Weight per piglet	18.1	4.7
Litter weight at eight weeks ..	556.0	89.0
Weight per piglet	50.1	12.7
Herd average litter at 56 days	326.0	181.0
Weight per piglet	39.1	25.1

It will be seen from this table that the average weight per pig at 21 days varies from as low as 4.7lb. (seven pigs) to as high as 18.1lb. (eleven pigs), resulting in a corresponding average weight per pig at 56 days of 12.7lb. and 50.1lb. respectively. While breed and strain do play a part in production, management has a far greater bearing on the results achieved in any one litter.

Analysis of Sow Production

For purposes of displaying how the average is made up litters are arranged in table 3 in weight groups, with 50lb. differences (at eight weeks) between each group. The percentage loss of piglets from birth to weaning falls from 51 per cent. in the worst cases to 5 per cent. in the best cases. The weight at weaning rises over the same range from 29.3lb. to 39.9lb., and the production per sow from 126lb. to 422lb.

No stronger case could be made out for the necessity and value of attention. It is not always the sow's fault that she has a poor litter, as in nine cases out of ten she can produce a good litter when she next farrows. Where neglect occurs at and before farrowing, subsequent attention is a disappointing waste of time.

From the previous table (columns 7 and 9) it is shown that the eight weeks' weight is slightly more on the average than three times the three weeks' weight. A difference of one or two pounds a pig at three weeks makes a very considerable difference to the weight the pig will reach at eight weeks. No magic wand or fortuitous circumstance after three weeks makes up for inattention before three weeks. Although the sow is the sole source of the litter's feed supply up to three weeks—and for this reason her worth as a milker is judged by the three weeks' weight of the litter—nevertheless warmth and cleanliness are helpful factors in good production, and with these, plus good health and adequate feed, most sows can produce good three weeks' weight. Those that cannot do so should be discarded. A further point of interest is noticeable here when the table is compared by numbers per litter. The general opinion has been that small litters produce heavy weaners. Almost without exception the table shows that the larger litters produce also the heaviest weaners.

Good weights at eight weeks are obtained by creep feeding of the litter as soon as they can be encouraged to start feeding. A little whole milk for a few days, followed up by skim as soon as they clean up the trough, plus a little meat-meal gradually introduced and increased up to ½lb. per pig per day at weaning, ensures good weaning weights, provided that scours, worms, and chills are avoided.

Good 8 Weeks' Weights

It is 18 years since New Zealand led the world by advocating the advantages of getting good weaner

TABLE 3—AVERAGES OF LITTERS AT 50LB. INTERVALS.

Eight Weeks (Litter weight)	Number of Litters.	Pigs		Loss Percentage (Birth to Weaning).	Weights at				
		Born.	Reared.		Three Weeks.		Eight Weeks.		Sixteen Weeks.
					Litter.	Piglets.	Litter.	Piglets.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
lb.									
101-150 ..	46	8.8	4.3	51	41	9.5	126	29.3	84.3
151-200 ..	82	8.0	5.6	30	59	10.5	178	31.8	88.0
201-250 ..	101	9.1	6.8	25	78	11.5	218	32.1	89.3
251-300 ..	105	9.5	7.9	17	87	11.0	274	34.7	92.8
301-350 ..	76	10.5	9.3	11	98	10.5	328	35.3	98.0
351-400 ..	38	11.0	9.5	13	120	12.6	374	39.3	95.7
401-450 ..	19	11.2	10.6	5	132	12.5	422	39.9	112.0
Total ..	467	4,414	3,440	..	..	..	..	..	..
Average of litters—									
Under 250lb.	229	8.6	5.8	34.8	58.5	9.9	185	31.5	..
Over 250lb.	237	10.2	8.8	13.7	99.3	10.7	361	41.0	..

weights. The reason for advocating this was simply that pigs at sixteen weeks old were generally two and a half times as heavy as they were at eight weeks. The heavy weaner became a porker at sixteen weeks old, and the 20-pounder was only 50lb. alive at sixteen weeks and required another six or seven weeks' feeding to make him saleable. During the past 18 years many countries have investigated the effect of heavy weaning weights on subsequent thrift, and the most telling advantages are those advocated in England—viz., that pigs of good weaning weight seldom suffer a setback as they grow, whereas those of light weaning weight are subject to setbacks due to worms, lung trouble, lack of vitamins, etc., that take their toll because of lowered vitality and inability to resist infection.

The idea of getting good weights at eight weeks served its purpose, but it told only half the story. The objective should have been good weights (100-pounders) at sixteen weeks. Few pigs are so badly abused as are weaners in New Zealand today. Usually they are turned out or neglected until they have grown a little, and those that survive the ordeal are brought in to feed and finish when they have reached a store weight of about 70lb. alive.

Attention Necessary

Had the ideal been good pigs at sixteen weeks, the present abuse of weaners might have been mitigated, and the fact that pigs are babies until they are four months old might have been established with very considerable advantage to the industry. Attention given to pigs until they are four months old is almost as valuable as that given to sows at and prior to farrowing. Recognition of this fact and improvement in this direction are among the urgent questions of the day.

If further evidence were necessary of the importance of owner attention, it is forthcoming from the poor results obtained during haymaking, Christmas, or other holiday time. Pigs making a daily gain of 1lb. to 1½lb. drop at Christmas or haymaking to ½lb. or even to zero per day. Sows which produce a good first litter are often penalised when they farrow during the holiday or haymaking seasons.

The pigs from these starved litters, which should reach porker weights before the close of the season, have to be carried through the winter on maintenance rations, thereby using up the early season production and skim-milk or whey that is required for the litters of the early-farrowing sows. The repercussions of a few days of inattention are far-reaching.

Large White sow and litter.

PRODUCTION COSTS

So much for the animal's performance and the part man plays in her achievement. What about the feed used and expenses associated with supplementing it? Farmers ask for information on these questions at lectures and demonstrations. Information collected in the course of litter recording has thrown considerable light on these aspects of pig production. The information has been assembled in the following tables for weaner production, for pork production, and for baconer production, with skim-milk as the basic feed, and for the first two with whey as the basic feed supply.

Weaner Production

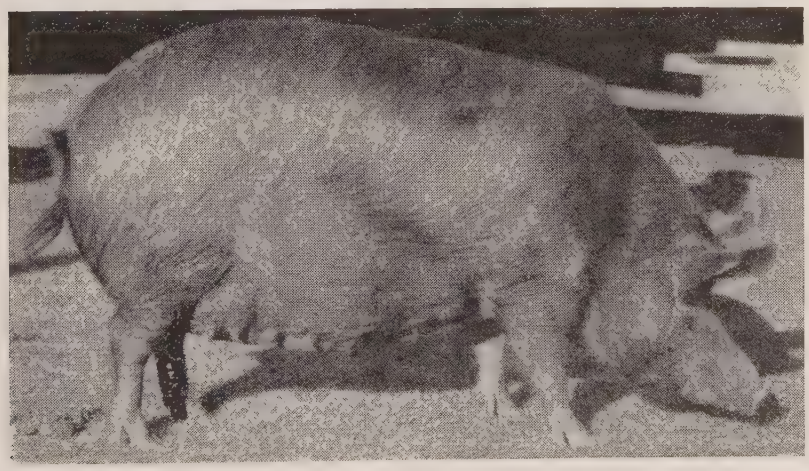
Table 4 sets this out for weaner production on skim-milk.

TABLE 4.

	1932-36.
Number of litters	332
Pigs weaned per litter	7.5
Skim-milk (gallons)—	
Per litter	672
Per pig	90
Meals used (lb.)—	
Per litter	154
Per pig	20
Total feed used—	
Per litter	830
Per pig	112
Cost of meal used—	
Per litter, at £16 per ton	293d.
Per pig, at £16 per ton	39d.

The return given above includes only the feeding of the sow twenty-one days before farrowing and during the suckling period. Calculations are based on 1 gallon of skim-milk being equal to 1lb. of feed.

It is shown that a weaner is produced for approximately 112lb. of feed. Large litters are produced more economically than small litters. The only outgoings are those for purchased feed-stuffs used, and with meals and



[*Green and Hahn photo.*

A fine type Tamworth sow.

concentrates at £16 a ton this cost is 3s. 3d. per pig weaned. As weaners in the spring are worth 30s. and those in the autumn only 10s., a fair average over the whole year would be 20s. per weaner. A weaner is produced for a feed cost of 3s. 3d., and shows a return of just over 2d. per gallon of skim-milk.

Porker Production

Skim-milk: Table 5 sets out the growth rate, etc., between the weaner and porker stages. The information, collected as it was in more or less a rough-and-ready way, shows very little variation from year to year. The pigs were weighed at fourteen-day intervals, and the information given by the farmer carrying out the trials in respect to the amount of feed used was accepted, although the amount to be used was laid down by the recording officer at each weighing.

TABLE 5—WEANER TO PORK PERIOD.

	1932-36.
Number of trials	111
Number of pigs	960
Weight at 56 days (lb.)	36
Final weight (lb.)	105
Weight increase (lb.)	69
Final age (days)	119
Rate of gain per day (lb.)	1.10
Feed consumed per pig; milk (gals.)	169
Feed consumed per pig; meal (lb.)	38
Feed per 100lb. live-weight	300*
Cost of meal used per pig (£16 per ton)	6s.

*Note.—The theoretical minimum feed requirements per 100lb. live-weight increase over this weight range calculated from Wood's tables ("Animal Nutrition," T. B. Wood, 1934) is 285lb. of feed of barley quality.

The table deals with 111 trials, representing 960 pigs, which show an average gain of 69lb. of live-weight in 63 days on a feed consumption of 169 gallons of skim-milk, plus 38lb. of concentrates. With meal at £16 per ton the cost of supplementary feeding between the weaner and porker stages is 6s. per pig. These, added to the figures already obtained for weaner production, give the following result:—

TABLE 6—FEED USED AND PRODUCTION COSTS PER PIG: BIRTH TO PORK STAGE.

	Skim-milk. Gallons.	Meal. lb.	Meal Costs. s. d.
Weaner	90	20	3 3
Porker	169	38	6 0
Total	259	58	9 3

A pig of 105lb. live-weight is produced on 317lb. of feed at a cost for meal purchased of 9s. 3d. Allowing for the trade deduction of 33 per cent., 70lb. of pig-meat is produced, which, at 7d. lb., realises 41s. 8d., leaving a net return of 32s. 5d. after deducting the cost of meal used. The dairy farm by-product now has a value of 1.50d. per gallon for the 259 gallons fed.

Baconer Production

Table 7 sets out the feed used between the pork and bacon stages.

During this period the meat increase is equal to 56lb., and by the same calculation as before skim-milk returns just under 1d. per gallon after paying for meals used.

These three stages can now be summarised as in table 8.

From this table it will be seen that the over-all return for skim-milk used for baconer production is apparently 1d. per gallon after paying for meals used.

PROFITABLE FEEDING

Whey

A by-product much despised as a pig food by many farmers, whey can be used profitably when greater quantities of supplementary food are added.

The following table sets out the results obtained with whey for the production of weaners:—

TABLE 9.

	1932-36.
Number of litters	135
Number of pigs	941
Pigs per litter	7.0
Meal used (lb.)—	
Per litter	182
Per pig	26
Whey (gallons)—	
Per litter	1,000 (666)*
Per pig	143 (95)*
Total feed used—	
Per litter	848
Per pig	120
Cost of meal used—	
Per litter (at £16 per ton)	346d.
Per pig (at £16 per ton)	49d.

*Represents ⅔ feeding value of skim-milk.

Comparing these results with those in Table 4, it will be seen that, with whey, meal consumption per pig does not differ much from that used with skim-milk.

Allowing 26lb. of meal per pig, the return per gallon of whey calculated by the procedure used previously for skim-milk is approximately 1.2d. per gallon after paying for meal used.

TABLE 10—FEED USED AND PRODUCTION BETWEEN THE WEANER AND PORKER STAGES.

	1932-36.
Number of trials	52
Number of pigs	503
Weight at 56 days (lb.)	38
Final weight (lb.)	100
Final age (days)	123
Gain per pig (lb.)	.91
Feed consumed per pig—	
Whey (gallons)	300 (200)*
Meal (lb.)	58
Feed to produce 100lb. live-weight	416*

*Represents ⅔ feeding value of skim-milk.

The table deals with 52 trials, representing 503 pigs, which show an average live-weight gain of 62lb. in 67 days on a feed consumption of 300 gallons of whey (equivalent to 200lb. of feed) and 58lb. of meal (mostly meat-meal). With meal at £16 per ton, the cost of bought feed between the weaner and porker stages is 9s. 2d. These figures, added to those set out

TABLE 7—1935-36.

Number of Trials.	Number of Pigs.	Final Weight.	Weight-increase.	Days on Trial.	Food used per Pig. Skim-milk.	Food used per Pig. Meal.
		lb.	lb.		Gallons.	lb.
9	63	180	75	56	346	37

TABLE 8—FEED USED AND PRODUCTIVE COSTS.

	Weight.	Days old.	Feed used. Skim-milk.	Feed used. Meal.	Cost of Meal at £16 per Ton.
	lb.		Gallons.	lb.	s. d.
To the weaner stage ..	36	56	90	20	3 3
From weaner to pork stage	105	119	169	38	6 0
From pork to bacon stage	180	175	346	37	5 10
Total feed used—birth to bacon stage, 125lb. carcass			605	95	..
Grand total			700		
Total cost of feed bought			..		15 1

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in August as follows:—

Auckland—1YA, on August 21, at 7.15 p.m., "Bacon Competitions and Their Purpose," by C. N. Wallace, Supervisor, Waikato District Pig Council.

Dunedin.—4YA, on August 12, at 7.15 p.m., "Selection and Care of Breeding Stock," by N. McDonald, Supervisor, Otago District Pig Council.

Palmerston North.—2ZA, on August 16, at 7 p.m., "Pigs," by L. Marsdon, Supervisor, Wellington District Pig Council.

Napier.—2YH, on August 13, at 7.15 p.m., "Litter Production," by H. Hopkins, Supervisor, Tairawhiti District Pig Council.

in Table 9 for weaner production, give the following:—

TABLE 11—FEED USED AND PRODUCTIVE COSTS TO PORKER STAGE

	Whey. Gallons.		Feed Equivalent.	Meal. lb.	Meal Costs. s.	d.
Weaner	.. 143	=	95	26	4	1
Porker	.. 300	=	200	58	9	2
Total	.. 443	=	295	84	13	3

Concentrates

Many farmers are still under the impression that the feeding of concentrates is a costly business. If concentrates are judiciously fed in conjunction with dairy farm by-products, the cost is not excessive. More important than the cost is the increased return as a result of more pigs fed on the by-products available, heavier weaners, more thrifty porkers and baconers, and a general easement in adjusting pig numbers to feed supply. When allowance is made for feed bought, the revenue from weaner production for skim-milk, making no allowance for time or overhead costs, is over 2d. per gallon for skim-milk. For pork, the revenue is 1.50d. per gallon, and for bacon 1.10d. per gallon respectively. For whey the earning value per gallon from weaner and from pork production is 1.2d. and 0.65d. respectively, with an average of 0.75d. per gallon for whey from birth to slaughter as porkers.

These figures are not intended to be an order of merit for pig production or to represent the actual net returns on a farm. Weaner production means more overhead in sows and equipment. The sow has to be fed between litters for four months, and, even though she lives on grass or other home-grown feeds during this time, some cost has to be reckoned with on this score. As pointed out on many other occasions, the returns from skim-milk are similar, whether weaners, pork, or bacon are produced, when the prices for these are 20s. for weaners and 7d. per pound for pork and bacon.

These returns are calculated on no waste occurring in the use of skim-milk or whey, and this is best achieved when something between ½cwt. and 1cwt. of meal is used for pigs for every cow milked, and is most easily achieved when weaners are being produced. The value of meal is further confirmed in a recent survey of a number of farms under the pig census scheme which gave the following results:—

[*Green and Hahn photo.*

An excellent maiden Berkshire.

TABLE 12.

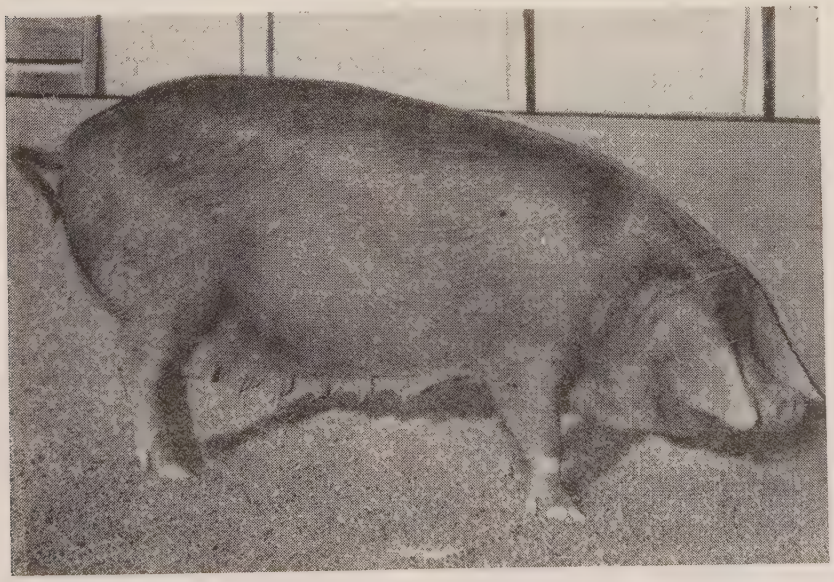
Pig-meal used per cow milked.	Gross revenue for skim-milk per gallon.	Net revenue for skim-milk per gallon, after paying for meal used.
	d.	d.
1cwt.	1.232	0.980
45lb.	0.912	0.800
12lb.	0.712	0.680

How Many Cows per Sow?

This is a further problem about which frequent inquiries are made. The figures obtained above make it possible to give some information on the subject.

From Tables 4, 5, 8, and 9 respectively it will be seen that—

1. For the production of weaners with skim-milk where dry sows are kept in the paddocks, one could be kept to every 2½ cows.
2. If 2½ gallons of milk per day were allowed per sow during the dry period, one to 3½ cows would be the ratio for weaners; with whey, one to every four cows where the dry sows get no whey, or one to every six cows if an allowance of five gallons per sow is made.
3. For pork production, one sow to seven cows on skim-milk, or one to eleven cows on whey.



[*Green and Hahn photo.*

Large Black or Devon sow.

4. For baconer production, one sow to fifteen cows on skim-milk, and one to twenty-four cows on whey.
5. In all cases winter feed must be provided in the form of roots or other grown crop.

Prices for Meal?

Producers are naturally concerned about getting their meal supply as cheaply as possible, and, actuated by this idea, they frequently lose sight of quality in their efforts to buy cheap or low-priced meal. Low-priced meal is invariably high in fibre, and is consequently low quality from the point of view of supplementing dairy by-products. It always pays to buy the best-quality meal and to use it sparingly.

In the following table, based on these data collected from farms, are set out the returns for skim-milk for porker production—i.e., 70lb. of carcass for 260 gallons of milk, and 57lb. of meal at different prices for pork, and at two prices for meal, £8 and £16 per ton.

TABLE 13.

Price of pork (pence per pound).	Revenue from one gallon of milk (pence) after paying for meal used.	
	Meal at £8.	Meal at £16.
4	0.88	0.64
4½	1.02	0.77
5	1.15	0.91
5½	1.29	1.06
6	1.43	1.18
6½	1.56	1.31
7	1.69	1.42
7½	1.83	1.58

At a guess one might have conceded the point that it would be profitable to use meal at a cost increasing by 10/- per ton for every ½d. increase in pork prices. Thus, pork at 4d. per pound, meal at £8; pork at 7d., meal at £16 per ton. From the table it is evident that every increase of ½d. in the price of pork would allow for an increase of at least £3 per ton for meal and give the same returns for skim-milk. No producer would be content to take fourpenny returns for pork when pork prices are 7d. per pound, but when he uses meal at £16 per ton and pork is 7d. he is getting five-sixths of an increase that arises from the increased value of pork. The other one-sixth goes to the grain producer, and it is unreasonable to expect, when pork is 7d. per pound, to purchase supplementary feeds at a price equal to that paid when pork is only 4d. per pound.

Good prices must be shared by all, and the producer of grain is entitled to his share. Bickerings about the cost of meal and the returns from feeding it will go on until the end of time, but the results obtained in these trials indicate that at present prices it can be used to give an increased return for dairy by-products comparable to other times and prices.

Returns from Farms

It may be said that the returns obtained from a few pigs fed under more or less careful conditions are no indication of the capabilities of all the rest of the pigs on the farm. To offset this point the total production details of 475 farms are set out in the following table.

The information contained therein shows that on these farms, at least, the returns for skim-milk are not as good as those obtained from the trial-feeding lots. These farms were those under the pig census scheme, and to that extent represent the production of average farms.

TABLE 14—RECORD OF 475 FARMS.

	1938	1940	1943
Number of farms	200	226	49
Averages—			
Cows per farm	43	42	44
Butterfat per cow (lb.)	259	264	254
Calves reared	10	10	10
Skim-milk for pigs (gals.)	25,805	25,841	26,884
Sows per farm	4.1	4.8	4.8
Cows per sow	10.5	8.8	9.2
Pig-meat sold (lb.) ..	4,458	4,718	4,652
Pig-meat per sow (lb.) ..	968	977	970
Pig-meat per 100lb. B.F.	40	43	40
Meal used (lb.)	2,058	4,114	3,739
Crop used ÷ 10 (lb.) ..	3,334	2,845	3,000
Meal used per 100lb. ..	46	87	80
Return per gallon of milk—			
With pig-meat at 7d. lb. and meat at £16 per ton (2,000lb.)	1.09	1.00	0.94

Apart from substantiating the claim that the returns from feed trial lots of pigs are obtained under actual farming conditions, these figures show that the returns for skim-milk with pig-meat at 7d. a lb. and meal at £16 a ton under ordinary farm conditions are still a good business proposition for the dairy farmer.

The table is worth careful study to discover the expenditure on pig meal per sow and per cow and the proportion of the total revenue on a dairy farm that pigs are capable of earning. From the above table this amounts to slightly under 17 per cent. of the gross earnings on the average of these farms.

Subsidiary to its first aim of finding the best animals, pig recording can also serve a most useful purpose in setting standards for the performance of animals, for the utilisation of feed surplus, and for the gross earning capacity of pigs. A great deal more work is required in this direction, and it is not until such standards are known and practised by the ordinary farmer that the task of finding the best animals or getting the greatest returns for pig-meat will be possible.

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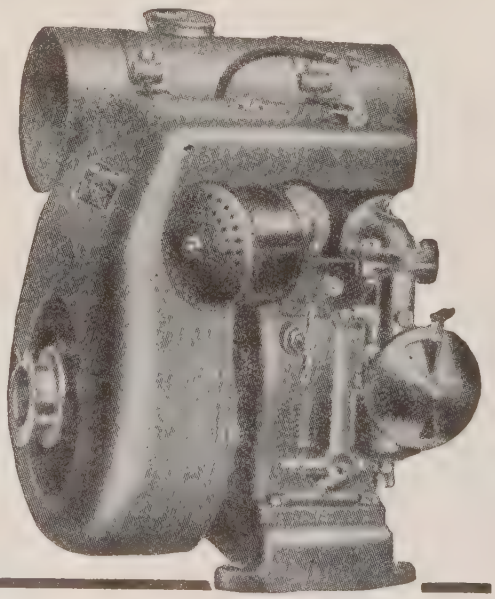


Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA, Auckland, at 7.15 p.m. on the following dates:—

August 5—"Identical Twin Research," by J. J. Hancock, Ruakura Animal Research Station.

August 12—"Pasture Progress," by S. H. Saxby, Agrostologist, Fields Division, Wellington.

August 19—"Mastitis," by J. C. Gerring, Veterinarian, Hamilton.

August 26—"Young Farmers' Club Session," S. Freeman, Organising Secretary, Y.F.C. movement.

THE FEED TAINT PROBLEM

By A. V. ALLO, *Instructor in Agriculture, Tauranga.*

TAINTED cream reduces returns to dairy farmers and factories. The most serious factor is the presence in pastures of land cress, also known as twin cress and hog cress. This article describes how the farmer may avoid feed flavours in cream.

OF all the problems facing the dairying industry, there are few which cause more concern than that of feed taints. Though there are few farmers today who do not appreciate the necessity of supplying clean cream to the factory, there are many who fail to realise the necessity of supplying a sweet cream, free of taints.

The problem is not new. For many years the feed flavour of much of the cream supplied from September to December has caused factory managers much concern. The degree of feed flavour varies from one district to another, and according to seasonal conditions. Some areas have trouble every spring, others are relatively immune. Again, cream quality is usually poorest in a warm, wet spring, and best in a dry spring when growth is slow in coming away. Taints vary in intensity and in type, ranging from those fairly easy to remove in the normal processing of the cream to those which, with our present knowledge, cannot be removed without difficulty.

For the greater part of the year, most butter manufacturers expect to get 93½ points for their butter, and aim at 94 points or higher. An increase of an undesirable taint will rob the factory of the vital half-point, or, worse still, may cause the day's make of butter to be penalised. Two or three suppliers may send in cream that can cause a drop in grade for the whole make of butter.

Coronopus procumbens: Wart cress.

The guaranteed price is based on butter grading 93-93½ points. The table below, based on a daily make of 850 boxes, illustrates the rewards available to dairy companies whose factory managers and suppliers combine to obtain the highest quality cream and butter.

The half-point between 93½ and 94 is worth £25 a day to the factory with an output of 850 boxes. If, through carelessness by the suppliers, or any other reason, there is a fall from 94 to 92½ points, the drop in income is £37 daily. It is thus in the interests of every dairy farmer to make himself conversant with factors liable to cause his cream to lose that finest quality, and do his utmost to avoid such factors.

Cleanliness, without a doubt, is the most important factor influencing cream quality. Much has already been written on this subject, and the Farm Dairy Instructors of the Dairy Division have done splendid work in raising and maintaining the standard of shed and dairy hygiene.

Cress Taints Most Serious

After cleanliness, the most important factors are taints imparted by food eaten by the cow. Milk is extremely sensitive to contamination and readily absorbs unpleasant odours. Unfortunately, such absorbed odours are not necessarily confined to sources outside the cow, but may also be absorbed through the system. Milk may be tainted before it leaves the cow's udder. These feed taints may be derived from several sources, but the most serious is without doubt that derived from land cress (*Coronopus didymus*), an annual weed that is spreading every year. It was originally confined to the South Auckland district, but reports of taints caused by this weed have been received in recent years from districts all over the North Island.

Coronopus didymus: Twin cress, land cress, or hog cress.

In the factory the cress taint is a constant source of worry till the end of December, since it is very difficult to detect in cold cream. A small quantity of tainted cream may so contaminate a large amount of untainted cream with which it is mixed before churning that the whole churning will be graded down in the grading stores. In one factory where this occurred the whole of the day's make of butter was second-graded with a loss to the suppliers of £100. Another weed called wart cress (*Coronopus procumbens*) is also a fairly common source of taint.

Unfortunately, as far as is known at present, treatment in the factory will not remove the cress taint from cream. The temperature required to drive off the cress oil is so great that the cream is then unfit for butter manufacture. Factory managers are compelled to adopt drastic measures in dealing with cressy cream, which is nearly always second-graded or rejected. It is thus obvious that

Grade.	Premium.	Loss.	Daily Gain.	Daily Loss.
93-93½	—	—	—	—
94	7d. a box	—	£25	—
92-92½	—	3½d. a box	—	£12
90-91½	—	1/2 a box	—	£50
2nd grade	—	3/6 a box	—	£150

measures to deal with this trouble must be taken on the farm.

To keep his cream free from cress taint the farmer has a two-fold task. First, he must appreciate the factors that lead to cress invasion and, by his system of pasture management, do his utmost to keep his land clear of cress. If, in spite of all his efforts, cress shows up in the spring, he must be prepared to institute controlled grazing of the infested areas.

Land cress is an annual weed, with trailing stems, finely-divided leaves, and small, white, inconspicuous flowers. It first appears in the late winter and early spring, and sometimes continues till Christmas. As it appears when the main pasture species are starting to make their main growth, it is obvious that its growth is inhibited in a dense, well-managed sward of grasses and clovers. When a pasture is thin and open the weed has an ideal chance to develop, and it is in such conditions that the main trouble occurs.

Causes of Infestation

These are the main factors favouring the appearance of cress in a pasture:—

1. Heavy winter stocking, leading to pugging and deterioration of the sward.

2. The all-too-common practice of leaving old stack bottoms and silage pits unfenced from stock. Cress often grows profusely on such areas.

3. If a pasture is cut regularly for hay or silage the sward tends to become open and bare patches appear. In such conditions it is easy for cress to enter into a pasture.

4. Cress is commonly found on all places where the frequent passage of stock has killed the grass sward—round gateways, stockyards, and races. Even if the rest of the farm is perfectly clean, cows may pick up sufficient cress in these bare patches to affect the grading of the cream adversely.

5. Even in a dense sward cress may show up where harrowing has been neglected. It often grows round old cow droppings, and is sometimes found in the bare patches at the base of such weeds as ragwort and Scotch thistle.

6. Grass-grub attack, by weakening a sward, makes conditions suitable for cress development.

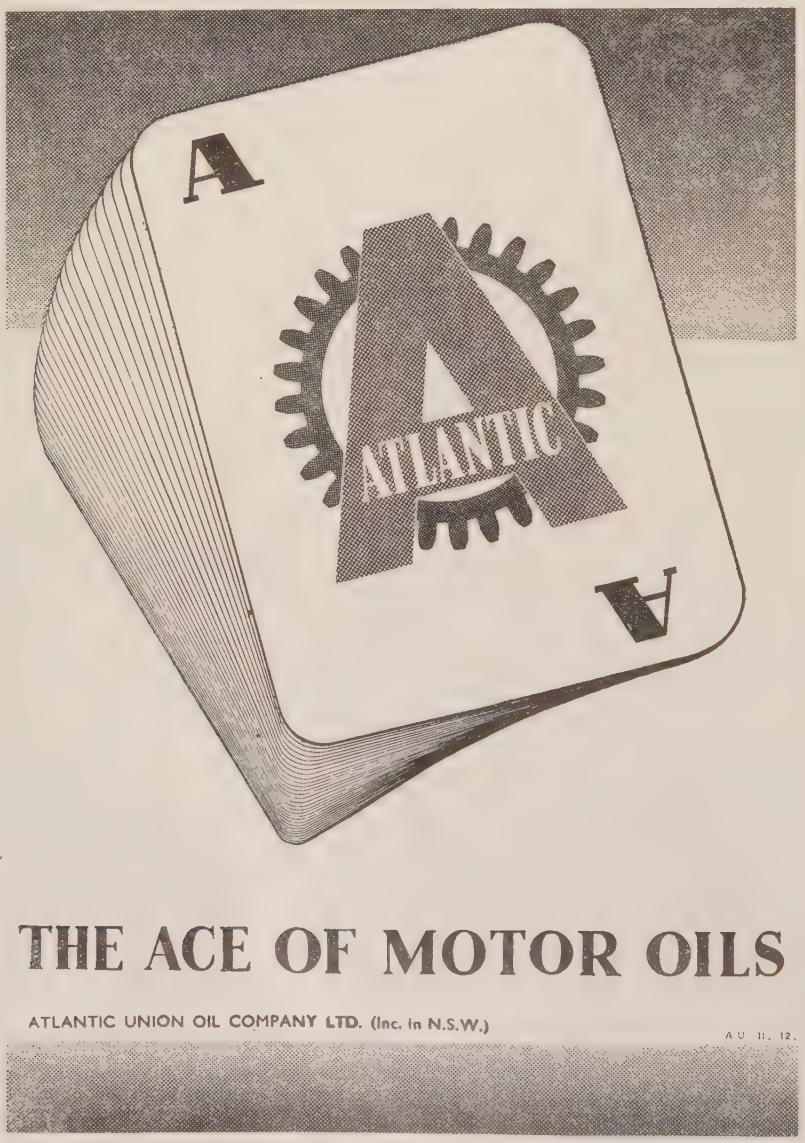
7. In the spring paddocks lying uncultivated after a crop often have a strong growth of cress, particularly on maize country. All such paddocks should be kept closed to dairy stock.

8. Finally, but by no means of least importance, cress will often show up in new grass, particularly on country where there has been a good deal of cropping. Spring pastures are usually worst in this respect, though heavy infestation has been noted on an autumn-sown pasture, especially if subjected to over-severe winter stocking or if the sowing has been rather late. In spring-sown pasture the danger is greatly increased by sowing poor-quality seed, or by sowing a mixture containing a preponderance of slowly-establishing species. If spring sowing cannot be avoided, it should be dominantly perennial ryegrass and white clover. When the seed is more readily available, the new hybrid H1 ryegrass may play a useful part in giving a quick, dense cover on spring-sown pastures in areas liable to cress.

It is evident that efficient pasture management plays a large part in keeping a farm clear of this weed. Broadly, the aim should be to control the stocking of a farm so that the pastures never become dangerously bare in the winter or early spring.

Grazing Cressy Pastures

Unfortunately, cress invasion may occur in spite of the utmost efforts of the farmer, and it is necessary to examine methods of dealing with infested pastures. Obviously, cressy pastures should not be grazed by a milking herd if possible. Sometimes the grazing of such pastures by milking cows is unavoidable, particularly if a large part of the farm is infested, for there may not be a sufficient area of cress-free pasture available. If cress appears in a paddock of new grass, the farmer may not be able to afford to feed it to dry stock because



of its great value for milk production.

To meet such circumstances a form of controlled grazing of cressy pastures must be employed, and considerable work on this problem has been carried out by the Fields Division and the Dairy Research Institute. It has been found that with most cows cress taint becomes evident in the milk within a short time of the weed being eaten. There is also evidence that some cows give a taint more readily than others, and the health of the cow may also be an important factor. The quantity of cress needed to produce a taint is small. Strongly-flavoured cream was produced by a cow that had eaten only 1½oz. of the weed.

The basis of any system of grazing a dairy herd on cressy pastures must be the removal of the cows from the source of the trouble a sufficient time before milking to allow the taint to work out of the animals' systems. The usual recommendation is to turn the cows out on to a pasture free of cress four hours before milking time. Unfortunately this control is not absolute, and will not invariably give a taint-free cream. It will result in a material improvement in the grade, but may not cause the taint to be completely eliminated.

Cows have been grazed on a cressy pasture till noon, placed in a concrete yard till milking time, and yet have given a tainted cream. Taint has also been known to show up 14 to 18 hours after the cress has been eaten. On the other hand, numerous cases can be quoted in which controlled grazing has given complete satisfaction. There is evidence that controlled grazing is less effective in muggy weather and most effective in dry weather.

The position should not be misunderstood. Removing the dairy herd from a cressy pasture to a clean one four hours before milking will in all cases result in a better quality cream than if the cressy pasture were grazed all day. If the cress infestation is heavy, this controlled grazing may not always give a taint-free cream. However, as far as our knowledge goes at present, it is the most satisfactory method of using a cressy pasture for the dairy herd with a reasonable chance of supplying a taint-free cream.

A taint very similar to that given by cress is imparted by the turnip and wild turnip. Soft turnips are frequently fed out as a supplementary succulent crop to the dairy herd during the late summer and autumn, and cream from cows feeding on this crop is frequently graded down for "turnip flavour." An attempt is made to overcome "turnip flavour" by pulling the turnips the day before they are eaten, so that they wilt. It is a sound policy to feed the turnips directly after the morning milking, denying the cows access to them in the afternoon.

The extent of weed invasion may be seen in this paddock left uncultivated after maize.

"Feedy" Taint in Spring

Though the cress problem is the most difficult for the factory manager, the most widespread taint is that known by the general term "feedy," which is found when cows are grazing on a rapidly-growing, lush pasture in the spring. This taint is quite different from that given by cress, and can largely be removed in the factory. However, the treatment adds to the cost of manufacture.

The problem of feedy cream is bound up to a large extent with the rate of growth of a pasture. It is usually more common on a clovery sward. When cows are turned out on to a soft, sappy growth of spring grass, after being fed during the winter on a fibrous ration, the digestive processes of the animal are upset by the drastic change of diet. This may be reflected in a feedy cream. Though clovery pastures are the worst offenders, grassy pastures are not immune. Where growth is soft and sappy, characteristic of much of the freshly growing spring pasture, the cream is nearly always feedy. As the growth hardens during the season the cream grade improves. Subterranean clover,

A typical open, weedy pasture through sowing cheap seed, giving ideal conditions for cress development.

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trefoil, and white clover have been proven capable of lowering the grade of cream if the growth is not really mature. Feeding hay to cows grazing on fresh spring pasture helps to give a more balanced diet, and in many cases has resulted in a material improvement in the grade. In a dry spring the cows give finest cream from very clovery pastures, because the rate of growth is so slow that the feed is firm and mature.

This spring feed flavour can be overcome to a large extent by pasture management or the feeding of hay. Fundamentally, it is a growth problem, with trouble far more severe on clovery than on grassy pastures. The aim should be to have grassy pastures in the spring, with growth as firm as possible. If a farm is hard grazed during the winter, grasses tend to be suppressed and clovers encouraged. When spring growth begins, such pastures rapidly develop a clovery lush herbage, with consequent grading trouble. Such conditions also predispose to bloat. Frequently the problems of feed taint and bloat go together, and measures designed to control one help to control the other.

A grassy pasture, the result of lenient winter grazing.

Saving Winter Grass

To provide a more mature, grassy pasture in the spring it is necessary to save a certain amount of winter grass. This can be done by closing up two or three paddocks in early April after they have been topdressed and harrowed. They should contain a preponderance of a winter-growing grass such as perennial ryegrass. When growth has reached 8 or 9in. it should be quickly grazed down to 4in. and the paddock again closed. If that is done there will be a good supply of mature, firm grass for the dairy herd in the spring. Such grass can be rationed out to the milkers for about an hour a day. It is also good policy, whenever practicable, to submit to this treatment a clovery pasture containing some ryegrass, with the idea of changing it into a grassy one. If this be done, there will be a greater quantity of grassy, mature feed available for the herd in the spring, and pastures that have given trouble because of the clovery nature of the sward will be more grassy and more likely to produce a taint-free cream.

A good deal of the bareness on many dairy farms during the winter is because supplies of winter supplements are not adequate for the stock carried. It is little wonder that some dairy farms are grazed bare in the winter when the hay saved may be as little as 3cwt. a cow. More adequate supplies of hay and silage, coupled with the establishment of lucerne, would go a long way toward ensuring that a farm does not get grazed bare in the winter. Combined with the saving of winter grass, and winter rotational grazing where practicable, this will play a large part in assuring that the herbage in spring is grassy and reasonably firm.

The part lucerne can play in the efficient management of a dairy farm cannot be overstressed. Not only is it of value in replacing pasture hay and silage to a large extent, but it is also of great value as a summer supplement to be cut and fed out in time of drought. Being a perennial crop, lucerne does not require regrassing every year, and there is not the same weed problem as occurs when land is being sown down to grass after an annual crop.

Where there is no alternative to grazing cows on a lush pasture, it has been found that a system of controlled grazing similar to that advocated in the case of cress will result in a material improvement to the cream grade. The feeding out of hay in the day time also gives good results.

Occasionally feed taint may be caused by sources other than those already discussed. Under certain conditions sweet vernal will impart an acrid taint to the cream. Pennyroyal, water cress, and wattles also impart a characteristic flavour.

The whole feed-taint problem is bound up in pasture management. The farmer who provides ample winter feed for his stock, practices rotational grazing, regular grass harrowing, and topping of rank summer growth, and saves a proportion of winter grass each year, has every chance of sending to the factory a high-quality cream.

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Raising Dairy Heifers on Fat Lamb Farms

By A. T. SHANNON, *Field Economist, Hamilton.*

THE high prices offered for dairy heifers in recent years emphasise the shortage of replacement stock for dairy farms. With the possibility of developing the smaller type of dairy farm for returned servicemen, there is likely to be a substantial demand for heifers, first of all for commencing stock and subsequently for replacements. One source capable of development for future supply is from fat lamb farms, and this article discusses the economics of the business from the grazier's point of view, as applied to Waikato conditions.

MORE than 300,000 heifers are required annually by the dairy industry for replacements, and of these only about 30,000, or 10 per cent., are raised on fat lamb farms. A number of graziers have come into the heifer-raising business in the last year or two, but quite a few have also given it up, and very likely fewer heifers are raised on sheep farms than for some years past. This may be a passing phase, and men who are now considering taking up the business will want to learn from the experience of others.

Securing Young Stock

The first difficulty in heifer raising is to secure satisfactory young stock at reasonable prices. Whatever the reasons for the present shortage of weaner calves for sale, there has been an increasing reluctance on the part of dairy farmers to raise them for the market, and this has been reflected in the high prices paid by graziers. Several years ago the best grade weaners could be purchased for £4, whereas in the last year or two prices have ranged from £5 to £7 or even more, and yearlings have sold quite frequently up to £11. This year, however, the results of the drought have affected the usual run of prices.

In addition to paying high prices, graziers are faced with the risks of buying stock for which there is no real guarantee of quality. For preference they buy their weaners on dairy farms where there is some check on breeding and butterfat production, and where general farm management conditions provide the best indication of whether the young stock has been faithfully reared and weaned. Experienced men usually seek to obtain their requirements of weaner calves from the same farms from year

More Dairy Heifers Wanted

TO maintain dairy cow numbers a replacement of approximately 17½ per cent. of the cows in milk at January 31 (the date of annual enumeration by the Census and Statistics Department) is required. About one-sixth of the replaced cows die, are destroyed, or are boiled down, and about five-sixths are slaughtered for boner or quarter-beef purposes. The number of cows recorded as in milk at January 31 each year corresponds closely with the number of cows calving normally in the preceding spring. The number of normal calving cows that drop out before January 31 are made up for on the average by the premature calving cows which are still milking by that date.

Therefore, a replacement requirement worked out on the number of cows in milk at January 31 also applies approximately to the number of dairy cows calving normally.

Allowing for losses in raising heifer calves from birth to two years of age means that the number of heifer calves saved from birth needs to be 20 per cent. of cows in milk at January 31, or 20 per cent. of cows calving normally. As on the average 48 per cent. of calves born are heifers, the proportion of the heifers resulting from normal calvings that needs to be saved works out at 42 per cent. (42 per cent. of heifer calves = 20 per cent. of all calves, bull and heifer).

If we are to increase the total dairy cows in milk by 100,000 by January 31, 1950, the extra heifers must come from the calves born in the springs of 1945, 1946, and 1947. From the figures available at January 31, 1945, it was clear that extra calves were saved in the spring of 1944. This may be of some help in case the necessary extra calves were not saved in the spring of 1945, which will not be clear until the figures for January 31, 1946, are available. Assuming that in these two years combined enough extra heifer dairy calves have been saved to account for one-third of the total extra requirement in raising total cows in milk by 100,000 by January 31, 1950, another third will need to be saved in both the spring of 1946 and the spring of 1947.

Allowing as well for maintenance requirement of an increasing number of cows in milk, the total requirement to obtain the objective represents the saving in the spring of 1946 and 1947 of 47 per cent. of all heifer calves resulting from normal calvings. Allowing for a third of the cows calving too late to enable calves to be readily saved from them, the proportion of heifer calves to be saved from cows calving early enough is raised to 71 per cent. Therefore, it will be readily seen that to raise cows in milk from 1,700,000 (believed to be the case as at January 31, 1946) to 1,800,000 by January 31, 1950, two out of every three heifer calves, from cows calving normally and also early enough in the season, will need to be saved in the spring of both 1946 and 1947.

Therefore, each dairy farmer should save the best two out of three normal heifer calves as they come during the progress of calving until he reaches the date beyond which he does not care to save calves. If he should happen to have a high proportion of well-bred heifer calves, or happen to have a high proportion of cows calving early enough for calf-saving purposes, he may end up with more than he feels is his due share or obligation. However, he should take into account that there will be other farmers unlucky enough to be getting a high proportion of bull calves,

or unlucky in experiencing an undue proportion of premature or late calvings. The more fortunate dairy farmers with well-bred and early-calving cows can make up for the less fortunate ones only by adhering firmly to the overall requirement; otherwise the objective will not be attained.

It is no use leaving the responsibility to the other fellow who you may consider is more fortunately placed for heifer calf raising. An average of two out of every three heifer calves born early enough for saving represents the goal to be achieved, and this can materialise only by one and all shouldering the responsibility.

There is a real responsibility, as the possibility of settling a large number of returned servicemen in dairy farming within a reasonable period of time depends on sufficient calves being saved.

Not only should more calves be saved, but more attention should be paid to their feeding. The mortality rate during the first winter could be greatly reduced if calves entered the winter in better condition; quality heifer calves should not be allowed to die because of poor feeding. Avoid set stocking calves in calf paddocks or after weaning in fields giving poor grazing. Fields providing quite good feed for 18-month heifers or mature dry stock may be quite unsuitable for calves. Set stocking in fields carrying abundant feed will usually give unsatisfactory results with calves, for the calves concentrate on the closely-grazed pastures and, as production from these areas diminishes as the season progresses, the calves may actually be short of feed while the field generally carries abundant growth. The best grazing for calves is in the cow paddocks, and they should be rotated round these paddocks three days ahead of the milking cows.

The benefits of rotational grazing are shown in the following table, which gives the results of six years' trials of rotational versus set grazing at the Ruakura Animal Research Station.

	ROTATIONAL GRAZING.		SET STOCKING.		
Year.	No. calves.	Mean weight Mar. 31. (lb.)	No. calves.	Mean weight Mar. 31. (lb.)	Difference weight. (lb.)
1940-41 ..	16	416	16	354	62
1941-42 ..	16	423	16	360	63
1942-43 ..	11	439	10	374	65
1943-44 ..	25	385	26	334	51
1944-45 ..	28	405	33	279	126
1945-46 ..	21	332	22	262	70

Well-grown calves winter well; the winter mortality of poorly-grown calves may range from 20 to 50 per cent. See that calves are the first stock on the farm to receive supplementary feed in the late autumn; get them used to hay and silage feeding before grass growth declines in the winter. Well-fed calves are not troubled with worms.

to year rather than buy from unproven sources. Clearing sales also provide a quota of reasonably reliable calves, but failing this graziers may finally have to draw on the stockyards for the balance of their requirements. Advertised lines supported by a reputable breeder's name are well sought after, but there is always the chance that other calves in the stockyards are of uncertain origin, may be badly weaned, and possibly some have been served. Whey-fed calves or dealers' lines are usually avoided.

Taranaki is a favoured source of supply for yearlings which do well when brought to the Waikato, and this yearling trade is eagerly sought after by some graziers. By buying as yearlings the losses of the first winter are avoided and there is no doubling up of stock numbers as when weaners are bought and held for fifteen to seventeen months.

Whatever the circumstances, it pays to get only the best stock and to cull unthrifty animals as soon as possible, for this reduces the ultimate losses and results in a higher average price as springers. A reputation for producing high-quality stock is also worth a great deal in terms of profit.

Care and Attention

To make a success of the heifer-raising business stock has to be well sheltered and adequately fed at all times, but particularly in the winter. It is not a bit of use trying to raise calves on anything but the best pastures, and as a rule only fat lamb farms in first-class order are suitable.

The difficulty is to make sufficient provision for hay feeding in the winter plus good pasture for finishing off the in-calf heifers without reducing the sheep-carrying capacity. Swedes for preference or chou moellier are ideal winter feed at the rate of at least an acre for every 10 in-calf heifers, provided there is reasonable run-off. Following this, about three weeks on good grass will put a bloom on the stock that means possibly pounds of extra profit.

Wintering heifers on crops results in high-class springers, but to carry 80 in-calf heifers and say 80 to 90 yearlings through the winter requires about 15 acres of good swedes worth approximately £10 per acre if sold for grazing, so the springers need to command better prices to make this payable. On the other hand, wintering on saved grass with hay must ultimately have an adverse effect on lamb production, though this is impossible to assess.

If it is impossible to give the considerably more time and attention required to make a success of raising dairy heifers, compared with carrying run cattle, they are best left alone. It is most inadvisable to stint the feeding or in any way to permit a setback to young cattle. They can be run only where cattle are not required for crushing fern or where it is not essential to graze stock hard for cleaning up purposes. Dairy heifers cannot possibly do the work of run cattle on fat lamb farms.

Older Dairy Stock

A rather different angle of the heifer business is seen on a few farms where graziers carry older dairy stock on rougher country. Purchased as two-year empty heifers, these can be run in conjunction with beef cattle, and they do not need the same care and attention necessary for weaners or yearlings. However, the scope for this trade is rather limited, and depends mainly on the possibility of securing the heifers at about £5. Moreover, quite a number fail to get in calf, though they can usually be quitted fat at a small profit.

A further angle still is seen where young empty cows are bought in the boner pens at the stockyards for use in crushing fern in place of run cattle. Grazed hard and without winter hay, these cows will often get in calf to a scrub bull where it would prove difficult under better conditions. There is no short supply as is the case with calves, and the cows can be bought in April and May for sale a year to fifteen months later. A proportion of the cows culled from herds for apparently failing to get in calf may actually be in calf, and, if in reasonable condition, these may be a profitable investment.

Raising young cows in this way for dairy replacements is not common. The appropriate class of country and farm management are required, and over a period it is probably a less stable business than heifer raising. Men with long experience consider that buying two-year empty heifers or young empty cows to get in calf is very risky, since most of them have been tried by dairy farmers and culled for some fault.

Surprisingly, the majority of graziers prefer to use good bulls on the heifers, for which there are two reasons. Buyers seem to lend weight to the fact that good bulls are run and this has to be considered as a selling point. Also, many dairy farmers will retain and rear first calves for replacements if they are of good average size and well bred. Again, some graziers are in a position to cash in on the low prices offered for yearling pedigree bulls lacking in condition. These are bought cheaply, run with about 15 heifers, and sold in good condition as two-year-old bulls. This often works out as a good investment.

Losses

On the face of it, the raising of dairy heifers appears to be a really profitable undertaking and one frequently hears of calves bought at £5 being sold as springing heifers at £14, a profit of £9. On the other hand, there is very little said about the losses. Where calves are bought as weaners, a number will be culled or may die in the first winter through unthriftiness, due partly to digestive upsets, worms, and other troubles arising out of bad weaning. Losses from these causes are probably less for the calves brought on to fat lamb farms than for those remaining on dairy farms, as the feed after sheep grazing is normally less larvae laden with the parasitic worms of cattle. There will be nearly 5 per cent. deaths, and some will prove in calf when bought. Stock losses in the first few months through culling or mortality average between 8 per cent. and 10 per cent.—some years much more, some much less. Experienced men will be able to minimise the financial losses by being more certain of the quality of the calves bought, by earlier culling, and generally by better treatment. Other than that, buying as yearlings is usually a sounder procedure.

Most graziers drench their young stock shortly after bringing them on the farm, usually with two doses of bluestone and nicotine sulphate at 10-day intervals. Phenothiazine compounds are also used with success, being given mostly to the less thrifty stock because of the high cost. Some calves that have been poorly weaned will deteriorate steadily under the best conditions and in spite of drenching, and nothing short of putting them on the milk bucket again can save these animals.

Calved yearlings are very damaging to the business, for they are of no use to anyone. Usually the calves are killed and the heifers dried off as soon as possible, to be disposed of as second calvers unless circumstances are kind. Otherwise they must be sold as opportunity affords at about calf value or less. Those men running a dairy herd on the property are in a better position to handle calved yearlings, slips, and out-of-step calvers, and may cut losses by milking these for a time.

The next source of losses after the first winter is due to abortion and failure to get in calf. These causes will account for at least another 10 per cent. and up to 15 per cent. over a period, except where the stock are vaccinated against abortion.

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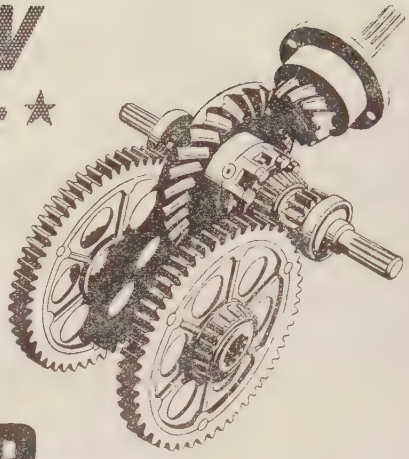

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There are still a number of graziers who have not taken advantage of the free service, which must result in more than halving these losses, for vaccination is claimed to be successful in preventing at least 80 per cent. of abortions.

In some years losses may be very high indeed, and this is usually the immediate cause of farmers going out of heifer raising. There is also trouble with late calvers and calved heifers. They will sell readily enough but usually a couple of pounds cheaper than springers.

Altogether, it appears that average losses from weaners to 2-year-olds approach 20 per cent. In other words, not much more than 80 per cent. of the weaner calves bought will be sold as 2-year springing heifers. Some men escape with little trouble over a long period, but usually a year of exceptional losses evens up the average. Probably most graziers have not estimated the extent of losses, for this is apt to provide an unpleasant shock.

The Profit Margin

There has generally been a net margin of £5 10s. over the last five or six years for the number of head actually reared from weaners and sold as 2-year springing heifers. One so often hears cases of much higher profits that it is easy to be misled until full weight is given to the lower prices offered for poor or backward cattle that are sold without publicity so as not to damage a man's reputation.

Taking a line of 100 weaner calves bought about April for sale fifteen months or so later, something like the following represents the position over recent years:—

		£	£
To	100 weaner calves cost £6 landed on the farm ..		600
By	80 2-year springing heifers average £11 10s. after droving commission and other charges are deducted	920	
"	10 slips and empty heifers at £5 net	50	
"	5 in-calf yearlings at £4 net	20	
	5 deaths	—	
			990
	Gross profit ..		£390

Experience and improved management will increase this profit, but one should not anticipate much better results in the first year or two of business. Selling on the farm, but not through agents, may save about 12s. per head expenses, vaccination almost eliminates slips, and fuller knowledge of calf buying may reduce the number of deaths and in-calf yearlings.

The margin outlined above compares with an average gross profit of about £3 to £4 per head annually for fattening run cattle, but apart from any-

thing else the risks are different in each case. With heifers there are uncertainties of weaner prices and quality, and the losses and the instability of the selling market. With run cattle the main uncertainty is the store market; deaths and losses are negligible, the fat market is assured, and less work and attention is required. Further, fattening run cattle fits in well with fat lamb production, while heifer raising is liable to compete with it.

Some years ago the shortage of run cattle drove store prices up and severely reduced the fattening margin. The heifer business tempted a number of sheep men, many of whom subsequently reverted to run cattle as soon as they could or when they discovered the losses involved in heifer raising. Others dropped heifers when their improved financial position made it less essential to go to the extra trouble for a not greatly increased return.

Heifer Sales

Heifer sales are usually made on the farm, the buyer being offered the selection of a minimum number at a stated price. A few men hold annual sales on their properties, which is a good venture provided the quality of the vendor's stock is well known. Heifers are sold in the stockyards usually only after the best have been quitted on the farm, though occasionally larger lines of quality springers come forward and these are usually advertised in advance. Mostly the stock are drafted up for colour, closeness to calving, and general appearances. Normally there is a guarantee either stated or implied that the heifers are in calf and if they are not the vendor will make an adjustment. He may even be prepared to meet the purchaser in some unfortunate cases of abortion or accident.

In the last few years it has become increasingly common to sell in-calf heifers in May so that the wintering difficulties are with the purchaser. This policy has proved very workable since heifers have been in short supply, but the stock need to be in good condition to secure satisfactory prices. June and July are on the whole good selling months, but August is poor. It is not until the September flush of feed comes that the market reaches a peak, when dairy men who are understocked are placed in a desperate position to cope with the feed and compete in the heifer market to make up the shortage in their herds.

In the Waikato the shortage of dairy heifers would have been more acute in the last two or three years but for the supply of replacement stock coming forward from farms changing over from cows to sheep. It is expected that there will be fewer cows obtainable in future from this source. Drought conditions in the past autumn have resulted in an unusually heavy culling of herds and this will further accentuate the shortage of dairy replacements. As a further result, weaner heifer calves are cheaper this autumn than for some seasons. The current prices of fair to good springing heifers at £11 10s. to £14 (early May) suggest that in two to three months' time a very high level will have been reached.

If more graziers are likely to take up heifer raising in the next year or two, it will be essential to have more calves for yearlings coming forward on the market than has been the case for some time.

Another approach to the provision of additional heifers for the dairying industry lies in improving the quality no less than the quantity of weaned heifer calves. Quite apart from breeding, improved feeding from calving onwards can go a long way toward providing thriving young stock for subsequent raising either on dairy farms or on fat lamb farms. This will serve to cut down the substantial losses between weaning and calving as 2-year heifers, for it is these losses which both discourage graziers and reduce the number of replacement heifers on the market.

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Woody Tongue in Cattle— New and Easier Treatment

By F. A. LINTON, *Farm Manager, Lands and Survey Department, Kerepeehi.*

THE treatment of woody tongue in run cattle by the injection of sodium iodide solution under the skin is described in this article. This procedure, which requires yarding and handling only once, will commend itself greatly to any who have had the laborious task of drenching cattle repeatedly with potassium iodide.

AMONG the beef cattle carried on the development areas near Kerepeehi, in Hauraki Plains County, there is a small number of cases of woody tongue each year. Whenever possible these are treated.

In 1941 and 1942 the method was by drenching with potassium iodide. A dose was given every day for nine days. After an interval of one week drenching was restarted, this time every other day, until a further six drenches had been given. The labour involved will be apparent to anyone who has handled run cattle. Apart from the labour and the loss of time, there is the inevitable damage to the cattle and to the individual who administers the drench.

The results from this method were:

1941: Of 20 heifers affected with woody tongue, 4 were condemned by the Stock Inspector and the remaining 16 were treated by drenching. Two did not recover and were condemned later.

1942: Eleven steers and heifers were drenched with potassium iodide. Three did not recover and were condemned.

Results of Injections

In 1943 the writer first became aware of the success achieved by others in treating woody tongue by single injections of solutions of sodium iodide into the blood. This procedure was not practicable, but there seemed to be no reason against trying injections of a similar solution under the skin. The following method was adopted: Two ounces of sodium iodide were dissolved in 40 c.c. of boiled water measured in the syringe. This gave a volume which just filled a 25 c.c. syringe twice. One syringe full was injected under the skin on each side of the neck.

It should be noted that sodium iodide must be used for injection, not potassium iodide, as the latter compound is likely to be harmful.

The results have been very good—

1943: Seven steers were injected and all recovered after one treatment.

1944: Nine 3- and 4-year-old steers were treated and all recovered. Some were sold fat within six months.

1945: Five steers were treated in October. Two were sold fat before the end of March, two others recovered, and one which was in very poor condition did not recover and has been condemned.

Thus of 21 cattle treated there have been 20 recoveries. Some of the treated cattle had open wounds under the throat, but these dried up in about ten days and were not noticeable in a month.

No After-effects

In about half the cattle injected a large swelling developed at the site of the injection. This soon disappeared and left no after-effects.

The 21 cases mentioned were kept under close observation and records of these are complete. An additional 20 have been treated, and this number includes some dairy cows and bulls. Records and observations are not so detailed, but results have proved equally satisfactory.

The method is much easier on cattle and on the stockman, and it is effective. It can be recommended for animals of all ages from 18 months upward. The usual aseptic precautions should be taken, the syringe and all other equipment used being boiled before commencement and the needle wiped with methylated spirits between each injection. If a glass syringe is used, the piston should be removed before boiling to prevent cracking of the barrel of the syringe.

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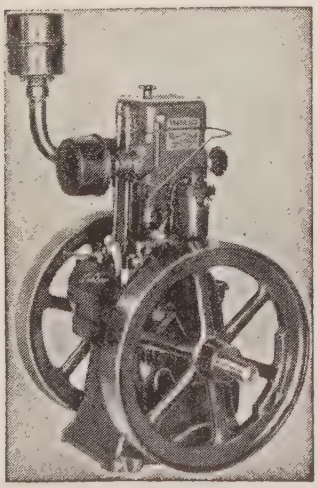

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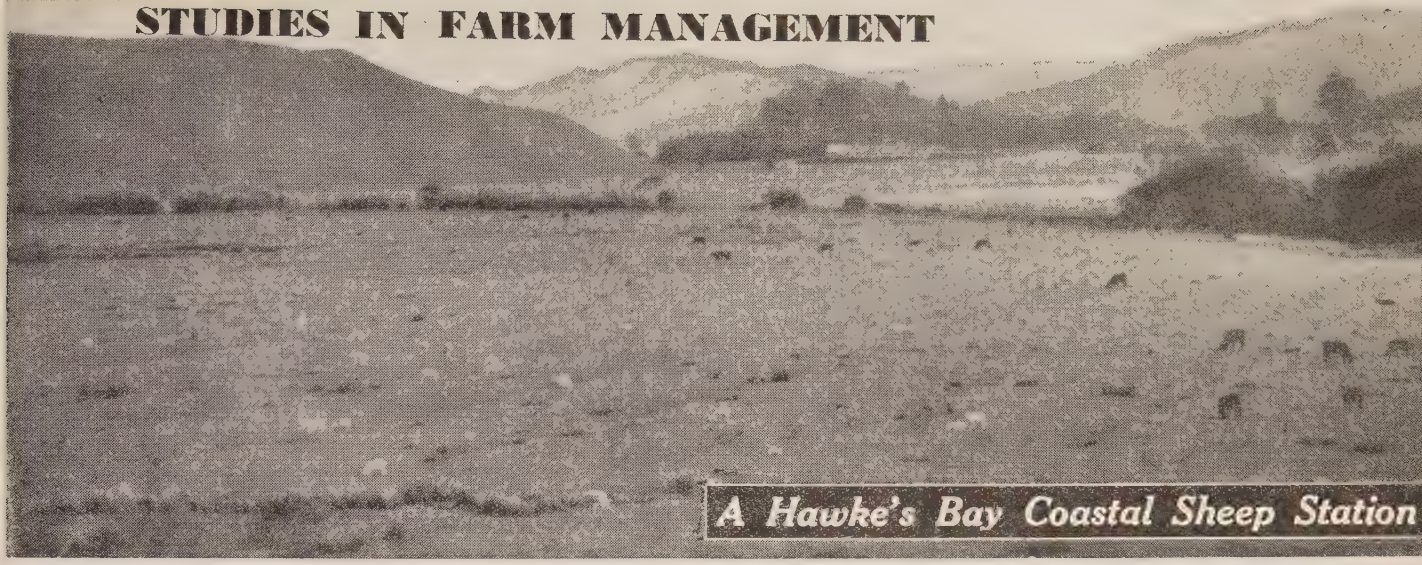


A Hawke's Bay Coastal Sheep Station

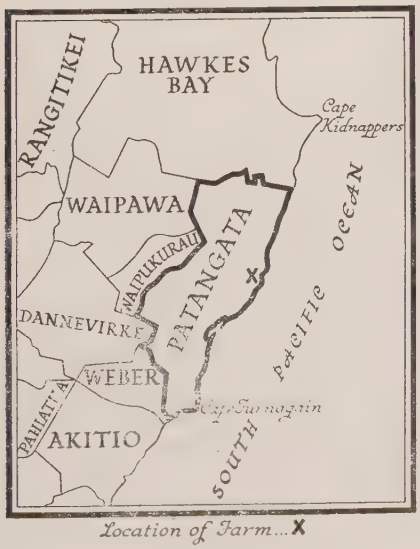
By R. P. HILL, *Fields Instructor, Hastings.*

THE coastal belt from Cape Kidnappers in the north to Cape Turnagain in the south contains some of the healthiest sheep country in New Zealand. The following article describes the Pourerere Bay district and the sheep station of that name situated in the Patangata County between the two capes referred to.

THE Patangata County, situated east of Waipukurau, is comprised of soils of relatively high fertility derived mainly from mudstones or muddy sandstones. Most of the area is steep or moderately steep and the area of ploughable land is limited; nevertheless small flats situated along most of the major streams are highly productive.

Climate

The annual rainfall averages a little over 40in. and is fairly well distributed. Frosts are not unduly severe near the coast. The climate allows hay and grass seed to be harvested and swedes are grown.



Location of Farm... X

Farming is practically confined to sheep and cattle raising. Romney Marsh crossbred sheep comprise the majority of the flocks, most of the wether lambs being sold fat and the remainder disposed of to flat land farmers in neighbouring counties. Ewe lambs are generally held to provide future breeding ewes. Aged ewes when not fattened are sold to provide breeding ewes to be mated with Southdown rams in fat lamb raising districts. Cattle are mostly Aberdeen Angus, of which many are carried, and the area provides large numbers of young cattle for Hawke's Bay.

EARLY HISTORY

On Captain Cook's second voyage to New Zealand in October, 1773, it is recorded in George Forster's book "Voyage Round the World" that when the ship Resolution was off Pourerere Bay it was boarded by two Maori chiefs from the pa at Pourerere, to whom Cook presented, among other things, two boars and two sows. According to Mr. J. G. Wilson in his book "History of Hawke's Bay" it would seem probable that these pigs were the progenitors of all the wild pigs which later roamed in Hawke's Bay.

Favoured with numerous beaches and safe anchorages for small craft, it was natural that settlement of the district should have commenced from the sea. Unlike the sheep-raising lands of Canterbury, there was no organised land settlement until 1850, in which year Mr. Donald McLean (later Sir Donald McLean, Native Minister) travelled to the district as Land Purchase Commissioner and entered into negotiations with the Maoris for the purchase of considerable areas of land. Before this there were some settlers occupying land by private treaty with the Native owners —a practice which at that time was contrary to the law of the land.

The first station to be acquired under strictly legal terms was Pourerere, a property of 50,000 acres stretching from Poanui Point in the north to Blackhead in the south, and Omakere Station to the west. This property was taken up originally in 1849 by Messrs. Northwood and Tiffen, the share of Mr. Northwood being taken over by Mr. C. J. Nairn almost immediately, a stone near the beach on which he has carved his name and the date showing that he occupied the property as early as 1848. Mr. Tiffen did not long remain and the property was farmed from then on by Mr. Nairn.

First Sheep

The first sheep to arrive were a mob of 3,000 Merino wethers in 1849, which had been purchased in Sydney, shipped to Wellington, and driven up the coast to Pourerere. There is no evidence that there was ever any native grass on the country at this stage; the land was covered with bracken fern, excepting on some shady slopes and gullies where there were clumps of mataia, kahikatea, and maere, with odd totaras; also distributed over the hills were ngaio, cabbage, karaka, and titoki trees. What these wethers lived on for the first year is somewhat of a mystery, but it is known that in subsequent development the bracken fern was burnt off and grass seed was sown on the ash. Ryegrass was the seed

sown in those early days, though in later years white clover, browntop, cocksfoot, and crested dogstail were included.

Mr. Nairn's father and mother, who later arrived from England, lived with him until their death, and are buried in the little cemetery close to the homestead. In 1872 that portion of the station including Blackhead and Aramoana Stations, 22,300 acres, was sold to Messrs. A. McHardy and J. H. Coleman at £2 per acre. Mr. McHardy later took over Mr. Coleman's share and eventually this area was farmed by Mr. McHardy's sons, Messrs. Percy McHardy and the late Leslie McHardy, as two separate stations, Aramoana and Blackhead.

Only Access by Sea

Access to Pourerere Station was by sea and all stores and equipment were brought in from ship by surf boat. Fortunately a deep channel running through the rocks close to the foreshore and bounded on one side by a sandy beach made it possible for a bullock team and dray to be driven into the sea on the beach side until it was abreast of the surf boat from which the stores were unloaded. The bullocks on many occasions would be in the water up to their backs.

All wool from the station was shipped in a similar manner. The wool was baled in 48in. packs and carted by bullock wagon to the foreshore, where it was pressed again in a hydraulic dump to half its original dimensions to facilitate loading. It was then stored on the foreshore to await the arrival of a ship, when the bullock team hauled it out to the surf boat. While this would appear an economical method, it was not in practice entirely satisfactory; as ships were not frequent and the weather was often unsuitable, the wool quite commonly awaited shipment so long that it missed the wool boat for England and thus missed the season's sales. However, as there were no roads, this practice had to continue right up to 1917, when a good lorry road was constructed to Waipawa and the railway.

Mr. C. J. Nairn continued developing Pourerere until his death. He built and endowed the Anglican Church which stood on the site of the old Pourerere Pa, where the cemetery is also situated. The original homestead was very small and was built on the flat land near the present station buildings, but in 1876 the present homestead was built on the rising ground above the beach and commanding a beautiful view of the beach and sea. The house was built of kauri timber which was brought from North Auckland by sea and sent

SOIL TYPES—Of the flat land: 1. Hastings silt loam. 2. Kaiapo heavy loam. Of the rolling land: 3. Wanstead clay. 4. Atua silt loam. 5. Maraetotara sandy loam.
Of the hilly land: 6. Te Apiti clay loam. 7. Raukawa silt loam. 8. Mokopika sandy loam.
Of the steep and very steep land: 9. Aramoana heavy loam. 9a. Sandy phase. 10. Mokamoka sandy loam. 10a. Calcareous phase.

ashore by raft. When the tide was suitable the raft was released and floated in on a big wave, then promptly secured and attached to a team of bullocks, which hauled it up above high-water mark.

Before refrigeration was introduced in 1884 wool was practically the only source of income, and all old sheep used to be boiled down for the extraction of the tallow. The site of the boiling-down works is still to be seen, although the boiling-down tanks or retorts have been put to a different purpose. As shown in the photographs they are now used as water tanks; they are of half-inch iron and immensely strong.

All fences were erected with totara posts which were obtained from the "Titoki" bush some 16 miles across country; all haulage over hills and gullies was done by bullock dray; there were no easy tracks. The laying of timber and wire on the fence-lines was done in the same manner; a bullock dray is widely built and low set, and, with the steady haul of the bullocks, does not appear to have capsized unduly. The return journey to Waipawa, 20 miles away, by bullock dray used to occupy four days.

On the death of Mr. C. J. Nairn in 1896 the property was divided among his three sons, the late Mr. Eric Nairn taking the Omakere Station on the western boundary. Some portions were sold and the balance of the original Pourerere Station is now being farmed in trust for the estate of the late Mr. J. Nairn.

THE STATION TODAY

Pourerere Station now comprises 3,364 acres situated in the Patangata County roughly 20 miles from the

nearest stock market, Waipukurau, which is now reached by a good metal road. It is mostly steep to moderately steep, but contains about 400 acres of fertile flat land and is representative of the bulk of the Patangata County. It is very well subdivided into 60 paddocks. The subdivision has taken into consideration the various soil types, which largely determine when and where stock of various ages are to be carried and have a big influence on the management.

Soils

The soils of the property have been mapped by the Soil Survey Division of the Scientific and Industrial Research Department and are shown on the accompanying map. There are some outcrops of sandy limestone, and, apart from the poorer strip in the south, all the soils are derived from lime-bearing rocks.

Differences in soils divide the property into four distinctive areas.

The northern area comprises heavy clay soils on moderately steep slopes. Because of its proximity to the sea, this is relatively early country and carries the two-tooth ewes.

The southern coastal area containing mudstone soils on very steep slopes is dry and early and carries the ewe hoggets.

On the western portions of the property the soils are rather similar to those in the southern coastal area, but slopes are not quite so steep and the texture is heavier. Most of this area has a northerly aspect and carries the four-tooth ewes.

A small area of soils of lower fertility occurring in the southern portion is noticeably colder country, being about a month later in growth than that on the coast; here the topsoil is thinner and the six-tooth ewes are carried.

The four-year-old ewes are carried on the very fertile flat country in the centre of the station.

There is a marked variation in carrying capacity between the groups.

The homestead (photograph taken about 1890).

Buildings and Equipment

The station has a homestead, manager's house and cottages, single men's quarters, Maori shearers' quarters, modern woolshed and yards, dip, etc., stables, smithy, carpenter's shop, implement sheds, and hay sheds. The usual range of station implements is kept, including tractors, swamp ploughs, grader, etc.

The old stables with two boiling-down retorts used as tanks.

Water Supply

Over 7 miles of piping laid from two springs supplies all flat paddocks, buildings, etc.; troughs are provided and on all hill paddocks water is supplied by springs and dams. The supply from springs has never failed.

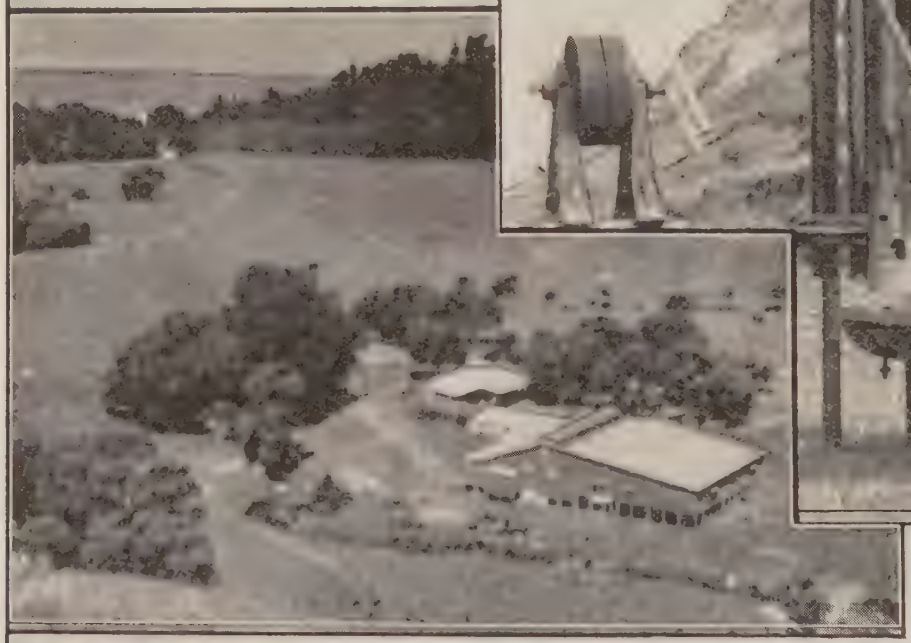
Management

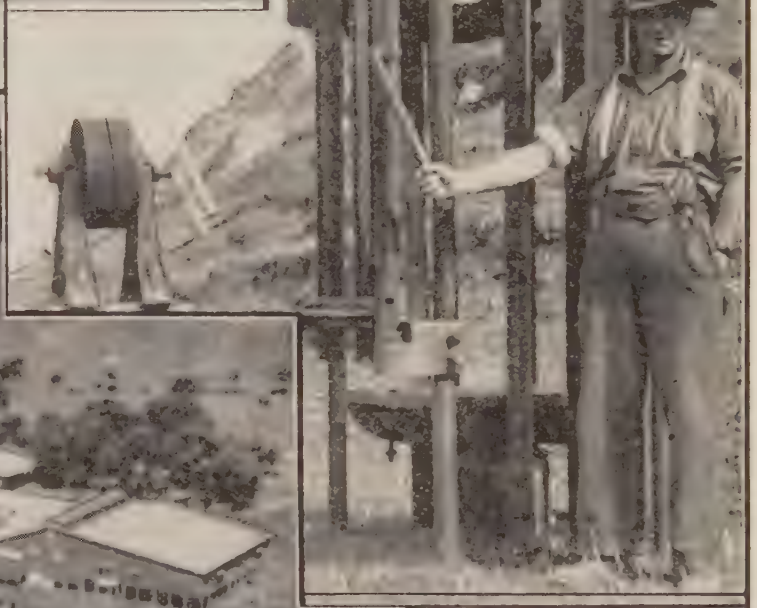
About 400 acres of flats now carry the best of English grasses, mainly ryegrass and white clover. A certain amount of this area is closed up each year for grass seed. Certified ryegrass has been sown and the yields are good. Some seed is kept for resowing on the station and the balance sold.

Although these flats have been in good grass for many years, it is only within the past 8 or 9 years that a thorough policy of bringing them up to full production has been adopted. Some of these flats are river deposits; others formed by the accumulation of debris slipped from the adjacent hillsides had a very uneven topography, with water courses meandering irregularly over them. It was necessary to level these areas out and the following policy was adopted: In early August the rough flats were ploughed with a swamp plough, roughly worked, and sown with a mixture of chou moellier and swedes in October. The Vilmorin swede has been found to give the best results, and the crop is used to fatten late lambs and as winter feed.

In the following September the land is re-ploughed and levelled off, watercourses being filled in with a grader and straightened out so that they run on either side of the flat. There is fortunately ample fall. Chou moellier and swedes are again sown in October, and fed off in late summer, the

MAORI SHEARERS' QUARTERS





WOOL DUMP ON FORESHORE USED UNTIL 1917.

ABOVE—WOOLSHED AND YARDS (HOMESTEAD AMONG TREES IN BACKGROUND). BELOW—TYPE OF ROMNEY MARSH USED ON THE STATION.

area being finally ploughed again and sown down with Certified perennial ryegrass and white clover in the autumn.

No fertiliser is sown with the grass seed, but in the following autumn the area is topdressed with 1 bag of superphosphate to the acre and half a ton of carbonate of lime.

Before regrassing, these flats carried 2½ mixed sheep to the acre, but as a result of the regrassing they can carry 5 ewes per acre. Lime response on this country is good and the lime application is repeated every 3 years at the rate of half a ton per acre. Superphosphate is applied annually to the flats at the rate of 1 bag to the acre.

When supplies of phosphate are more plentiful it is intended to commence topdressing on the hill country, which has received no fertiliser yet. This year it is also intended to plough up, crop, and regrass certain of the lighter hill-country paddocks which are sufficiently easy to work, and a trial is to be given on one paddock with the giant discs preparatory to re-sowing.

Considering the age of the hill paddocks, the wonderfully good sole of grass they are carrying is evidence of good management, but it is intended to break up and regrass the worst of the poorer paddocks to increase the ryegrass content.

Crops and Winter Feed

Fifteen to 25 acres of chou moellier and swedes are grown each year and abundant hay is saved. The threshed hay from grass seed crops is also baled and stored.

Stock and Stock Management

In 1928 4,111 breeding ewes were carried and 500 head of cattle of all ages.

Last year the carrying capacity was as follows:—

6,500 breeding ewes: 2-tooth to 4 years old.

3,000 hoggets: 1,800 of these are being held as 2-tooth flock breeding ewes. The balance were sold recently, the tops of which realised 31s. 10d. at the sale.

160 rams.

340 mixed sheep.

900 head of cattle, 350 of which are breeding cows, the balance being up to 2-year-old heifers, bulls, and calves.

19 horses.

Approximately 1 cattle beast is carried to every 4 acres; all cattle are females, except yearling steers, which are sold in the spring.

The sheep carried are Romney Marsh, and the very fine type of Rom-

Upper—View north-east from homestead verandah, with old station buildings in left background. Middle—Looking from the razor back towards the homestead. Lower—Steep mudstone slopes on coastal country.

ney ram used is well woolled, of good constitution and excellent bone, and does well on this country.

Rams are turned out on March 1 and at present an average of 94 per cent. of lambs is tailed.

All ewe lambs are held until 2-tooths and all wether lambs are sold as fats; 800 to 1,000 are sold fat off their mothers in December, the balance being fattened on crops and grass. No ewes are carried after 4 years old, and all sheep are culled annually.

Shearing takes place in December, the lambs being shorn with the ewes. This year the ewes averaged about 8lb. of wool per sheep and the wool realised 16d. per lb. The hogget wool realised 18d. per lb.

All cattle run are Aberdeen Angus. Bulls are turned out on December 1 and all cattle are culled annually. The steer calves are sold in the spring and the heifer calves are held until they are two years old and then culled, the best being kept for station breeding. All aged cattle are sold off the property fat.

An interesting point in the management of the stock is the selection of grazing areas for different ages according to soil type. The hoggets are always run together with cattle on the steeper hills, and the carrying capacity is four hoggets to the acre without topdressing. The 2-tooth ewes are run on the smaller paddocks on the northern hills, which, without topdressing, are able to carry two ewes to the acre comfortably. The four- and six-tooth ewes are run on the southern country at the same rate. The older ewes are always run on the flats at the rate of five ewes to the acre, with topdressing at the rate of 1 bag of superphosphate per acre.

Acknowledgments

Thanks are expressed to the Soil Survey Division of the Department of Scientific and Industrial Research for data in the soil map and to the Lands and Survey Department for drawing of maps; to Mr. J. G. Wilson's "History of Hawke's Bay," and Mr. Percy McHardy for much early history.

RETIREMENT OF Mr. G. M. VALENTINE

Long Service to Dairying Industry

WHEN he retires on July 31, 1946, Mr. G. M. Valentine will have completed almost 34 years in the service of the Dairy Division and 56 years in the dairy industry.

He was born in 1875, at Waikouaiti. In 1890 Mr. Valentine started work in the employ of the Taieri and Peninsula Milk Supply Company, Dunedin. In 1893, in company with many other southerners who later were prominent in the dairy industry, he came to the North Island, where he accepted a position in the butter factory of the New Zealand Farmers' Dairy Union at Palmerston North, then regarded as one of the most efficiently-managed organisations of its kind in the colony. In 1894, when he was still only 18 years of age, he commenced his career as a manager, being appointed to the managership of the Featherston butter factory. He managed the Oaonui dairy factory in Taranaki from 1898-1902, and the Marlborough dairy factory at Spring Creek, Blenheim, from 1902-1912.

In 1912 he joined the staff of the Dairy Division as a Dairy Instructor with headquarters at Auckland, and during the years which followed did much useful instructional work, some of which was of a pioneering nature, among the dairy factories in the northern peninsula. It was in the north that the practice of cream

grading—the classification of cream according to quality and payment according to grade—was introduced. Mr. Valentine was responsible for the official introduction of cream grading in the north, and from this beginning the system extended throughout New Zealand. He was also the first to put the use of neutraliser for the reduction and standardisation of acidity in cream on a proper footing by preparing an acidity reduction table which has long since become the recognised standard for butter factory practice.

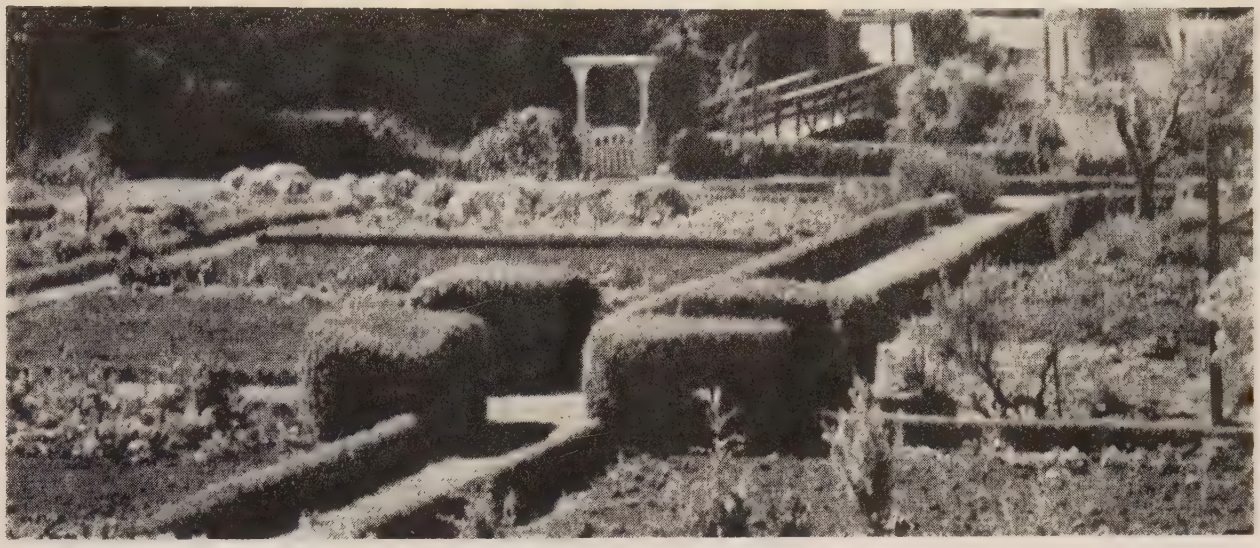
In December, 1927, in readiness for the opening of dairying courses in 1928, Mr. Valentine was appointed, under the title of Dairy Factory Superintendent, as representative of the Dairy Division on the staff of Massey Agricultural College at Palmerston North. Among other things, he designed and drew plans for the Massey Dairy Factory, and also selected and supervised the installation of the plant, some of which required adaptation or had to be specially designed to suit the particular requirements of an experimental and demonstration factory. He also drew up the original lecture courses in dairy factory practice relative to manufacture, management, and routine procedure. His wide knowledge and experience, his gifts as a leader and demonstrator, and his personality made him eminently suited for the difficult and responsible tasks which his position involved. His original work at Massey College, where young men receive their foundation technical training as future dairy factory managers, may be regarded as being of outstanding and enduring value to the industry. Further, the Dairy Factory Superintendent of Massey College is in effect a liaison officer between the Dairy Research Institute and the Dairy Division, and the spirit of good will and co-operation which Mr. Valentine built up is not the least of his achievements.

During 1933-34 he visited England and the Continent of Europe to gain knowledge of the consuming end of New Zealand dairy products, and to make himself conversant with manufacturing methods in other countries. On his return he was appointed Assistant Director of the Dairy Division, and on the retirement of Mr. W. M. Singleton in 1944 assumed the position of Director.

His services to the industry, apart from those directly associated with the positions which he has held, have been many and varied. He is the author of many articles and bulletins which have served as the text books of the industry. His specialised study has been the most complicated one relating to yield and its influence on dairy factory payments, and on this subject he is a recognised authority.

Practically everything of importance in the development of New Zealand's great dairy industry has occurred during Mr. Valentine's working years. He can look back with satisfaction on the fact that he has taken an active and creditable part in so many of those developments.

HOME GARDEN PLANNING



By D. K. PRITCHARD, *Instructor in Vegetable Culture, Wellington.*

THE home gardener, if he has available a large enough area of land, should now be planning the production of a continuous supply of those vegetables from which, alone, can be obtained the vitamins so necessary for the maintenance of good health.

AMONG competent gardeners August is generally recognised as a time for cleaning up, planning, and preparing for the coming season.

Hedge Trimming

Live hedges surrounding gardens should be kept trimmed to a height which, while providing protection from devastating winds, will be determined by the proximity of growing vegetable crops. While adequate shelter is necessary, best results in vegetable growing cannot be secured from crops grown under shady conditions.

Some live hedge varieties will stand cutting back harder than others. When trimming to prevent valuable garden space being lost to production do not exceed the limit from which the species will recover.

After trimming up the shelter belts it is advisable to dig close to the roots and bury all weed growth, thus depriving injurious insects of host plants upon which they live while more favoured crops are not being grown.

Young, succulent growth of some shelter hedges can be composted, and will decompose rapidly under proper treatment in a compost heap.

Seeds

It is notorious that far too much seed is used for the quantity of vegetables produced in home gardens. This is easily understood when production is balanced against the approximate number of seeds per ounce for the principal vegetables grown. Following are a few examples:—

Plants.	Seeds per oz.	Plants.	Seeds per oz.
Beetroot	.. 1,500	Leek	.. 9,000
Broccoli	.. 8,000	Lettuce	.. 16,000
Cabbage	.. 7,000	Swede	.. 10,000
Cauliflower	.. 8,000	Turnip	.. 12,000
Carrot	.. 20,000	Tomato	.. 7,000
Celery	.. 75,000		

From a study of these figures, and allowing for an average of 70 per cent. germination, it will be appreciated that the quantity of vegetable seeds necessary for production in the home garden is very much less than is generally supposed.

Planning the Garden

From observations made during the past growing season, and according to replies given to many enquiries, evidence is not lacking to prove that a great deal of trouble in the home garden could be avoided if more attention were given to rotation of crops.

"Sickness" is the term often applied to soil in which, for instance, it may not be possible to grow a disease-free crop of carrots. This so-called sickness could, in many instances, be traced directly to carrots being grown on the same area of the garden with too short intervals of time between the crops. Carrots are by no means the only vegetables which react adversely to non-rotation. All crops grown in the garden may be affected to some extent.

Crop rotation, however, is only part of a garden plan which should include the kind and quantity of crops which it is intended to grow during the coming season. Also stocks of seeds, manures, aphicides, insecticides, and spray materials which it is expected will be required should be obtained. Damaged seedling boxes should be repaired or new boxes made. Sufficient soil should be sterilised to grow all the seedlings for the season. To prevent re-contamination sterilised soil should be kept in a container until it is required for use. An efficient and economical method of sterilising a small quantity of soil is given in an 8-page leaflet "Vegetable Production in the Home Garden," which may be obtained free from any office of the Department of Agriculture.

Summer Cabbage

The first transplanted crop in the garden is likely to be summer cabbage —Golden Acre. Varying according to differences in climatic conditions throughout the Dominion, mid-July is considered the best time for sowing seed of this variety of cabbage. If the seed is sown outside, a sheltered part of the garden should be chosen. For this early sowing it is advisable to use a seedling box which should be not less than 5-6in. deep. The seed should not be broadcast, but sown thinly in rows 2in. apart. This will allow for the production of good, stocky plants. Seedlings crowded in rows can be transplanted into other

boxes and grown on until large enough for setting out in the garden.

Spring Cabbage

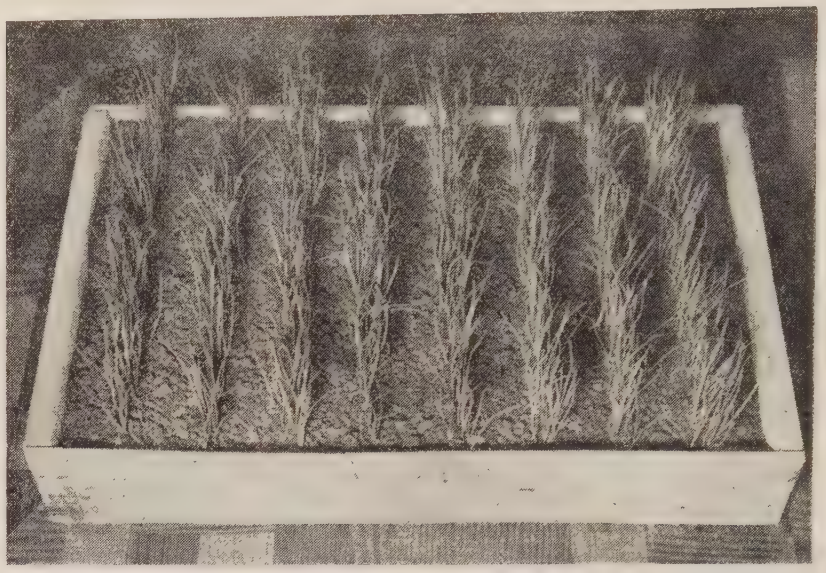
Spring cabbage plants which have been properly cared for during winter should now be making good growth, and by mid-August will be of suitable size for use. Unless the outside leaves are showing brown spots ranging in size from ¼ to 1in., every part of the head is edible. Where this fungous disease has recently made its appearance its spread can be prevented by spraying the plants with Bordeaux mixture.

No arsenate of lead should be used in the spray mixture for spring cabbages. It is not necessary, and may result in undesirable residues remaining on the leaves.

Rhubarb

Roots of rhubarb which have been dug out and put aside for subsequent division should now be examined for bud development. Towards the end of July and under ordinary weather conditions the strongest buds should become prominent, and it is these which should be selected for planting out in a new bed. The roots may be divided by a heavy knife or a chopper. Trimming too close to the bud is not advisable, and planting should take place as soon after division as possible.

For best results a rhubarb bed should be deeply dug and plenty of well-rotted stable or farmyard manure incorporated with the soil. A liberal dressing of dry fowl manure and superphosphate or blood and bone manure may be mixed with the soil at the time of planting.



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Onions

Seedlings from autumn-sown onion seed should now be ready for transplanting and early August is generally considered the best time. The part of the garden to be used should be dug early to allow for consolidation. This applies particularly to light soils, as onions grow best in a compact seed-bed.

Two or three weeks before planting, bonedust at the rate of 3 to 4oz. per square yard should be broadcast over the bed and worked into the soil. The wide onion spacing often seen in home gardens is not necessary, and cannot be recommended. Commercial growers rarely space rows further apart than 12in., and 2½ to 3½in. between plants in the row is quite common. Pukekohe Longkeeper is the variety recommended for good storage quality.

Cauliflower

Well-grown cauliflower plants of the Early London variety may be set out during August with reasonable chance of being harvested before Christmas. The soil should be in good fertile condition but not too rich or over-supplied with nitrogen. Only plants which at no time have been checked in growth by cold weather should be set out. If transplanted, retarded seedlings will make poor curds which will invariably run to seed in late spring or early summer.

Carrots

Only a small quantity of carrot seed should be sown during late July or early August. For this sowing Early Short Horn, which is said to mature in 70 to 80 days, is recommended. As soon as the soil is in reasonably good working condition shallow drills may be made 9in. apart, the seed sown thinly, and very lightly covered, preferably with a mixture of river sand and compost. Sparse sowing will save thinning, which temporarily disturbs the growth of the young roots permitted to remain. A part of the garden should be chosen as far as possible from last season's carrot bed or the remains of a main crop. In the latter instance, the matured roots should be removed and the best specimens stored.

Tomato seedlings grown in a paper pot in a kitchen window.

Lettuce

Plants from June-sown lettuce seed can be set out from July onwards. Good soil conditions are necessary, but no stable manure should be dug in immediately before this planting. Where bad or indifferent drainage conditions exist, a raised bed should be made up for the plants.

Tomatoes

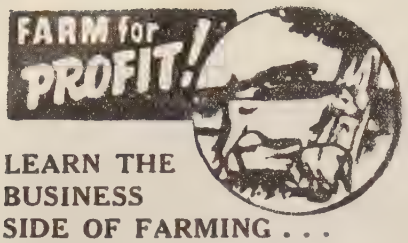
Where no artificial heat is available preparations should be made during August for sowing tomato seed. In areas where rainfall during December and January is not high it may be advisable to raise a few plants of a dwarf variety, which, when grown under good conditions, will mature some fruit earlier than plants which are fastened to stakes.

The desirability of using sterilised soil for growing tomato seedlings is particularly stressed. This practice will ensure that the seedlings have been grown in disease-free soil.

In a 4 or 5in. flower pot enough seedlings can be raised for one's own requirements. A few small stones should be placed at the bottom before filling it with soil. A small fruit tin with holes punched in the bottom is quite suitable. When the pot is filled, the soil should be gently but firmly pressed down and the seed evenly distributed over the surface. A light covering of compost or a mixture of sand and compost will be sufficient. This should be pressed firm and covered with glass, on top of which may be placed a piece of light-coloured paper—newspaper will do. As soon as the seed starts to germinate it is advisable to remove all covering from the pot.

Where the garden is low-lying it is better to make up a raised bed in which to set out plants or sow seeds for vegetables for early spring.

[Sparrow Industrial Pictures photo.



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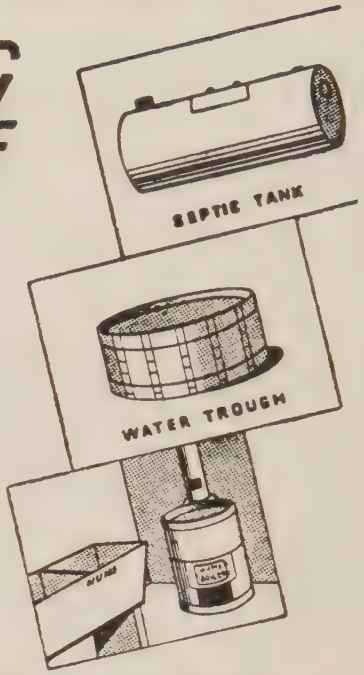

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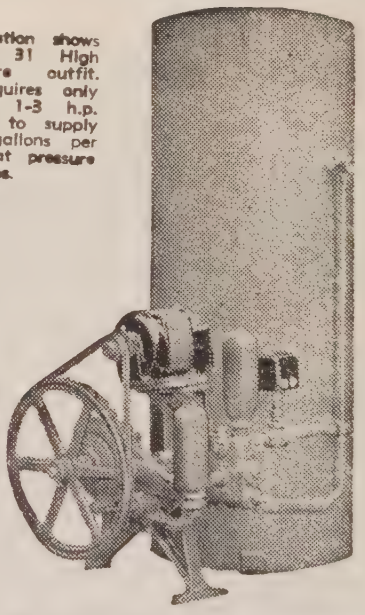

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ESTABLISHING A TOBACCO FARM

By N. J. ADAMSON, *District Supervisor, Horticulture Division, Nelson.*

AN apparently general increase in tobacco consumption seems to warrant a further expansion of New Zealand's tobacco-growing industry, which has shown a steady increase and is now soundly established. It has been estimated that an increase of two-thirds of the present leaf production could be absorbed, and as the establishment of a tobacco farm would seem to be a sound economic venture, the following guidance on the launching of such an enterprise is timely. Prospective tobacco farmers are advised, too, to consult officers of the Horticulture Division of the Department of Agriculture in their district, whose advice and assistance are freely available.

IT is estimated that tobacco leaf production amounting to 5¼ million pounds would be the safe aim in New Zealand—an increase of 2¼ million pounds over present production. Assuming an average yield of 1,000lb. per acre, there is room for the planting of another 2,250 acres. An apparently general increase in tobacco consumption seems to warrant even greater expansion.

The comparative figures for the 1932 and the 1945 tobacco harvests are:—

	1932.	1945.
Acres cropped	2,500	3,383
Poundage sold	2,000,000	3,288,968
Number of licensed growers .	700	487

Legislation Governing Industry

The industry is governed by the Tobacco Act, 1908, and its amendments (which deals principally with the manufacture of tobacco), the Tobacco Growing Industry Act, 1935, and the Tobacco Growing Industry Regulations which, with amendments, were consolidated on June 14, 1945.

The Tobacco Growing Industry Act, 1935, provides for the establishment of the Tobacco Board, which consists of a Government representative, four representatives of the growers, and four representatives of manufacturers. All commercial leaf in New Zealand is now grown, bought, and sold under a system of licences and warrants under the administration of the Tobacco Board. Planned production is one of the objectives of the board.

To prevent the sale of leaf at very low prices unprofitable to growers a minimum price was fixed under the Board of Trade Act, 1919. At present this is 1s. 2d. a lb. The price of leaf is fixed by a price order which specifies the minimum average price to be paid by the manufacturers for raw leaf. For the 1945 crop the price was 2s. 0½d. for flue-cured leaf and 1s. 9½d. for air-dried.

Extension of the production of tobacco leaf is one of the main objectives of the Tobacco Board and the Government, and manufacturers are required to use a minimum percentage of New Zealand leaf over their total manufacture. This began at 20 per cent. on January 1, 1941, and has been raised gradually to the present minimum of 30 per cent. effective since August 1, 1945.

Location, Soil, and Climatic Requirements

Commercial tobacco growing in New Zealand is confined entirely to certain areas in the Nelson district where the soil type, combined with the general climatic conditions, proves ideal for the production of high-grade leaf. The climatic requirements of tobacco are relatively high summer temperatures, a rainfall of at least 35in. with good rains in November, December, and January, and absence of hail storms and high winds during the growing months of November to March inclusive. Only sands and sandy loams can be considered for the flue-cured type, but for Burley, the air-dried type, medium loams are suitable. An intensive soil survey of the Nelson district has been carried out by the Cawthron Institute and indications are that there is still ample land of the suitable types not being used for tobacco, hops, or fruit to allow for an expansion of more than the 2,250 acres required.

In addition to suitable soil types and ideal climatic conditions, the Nelson district provides the facilities for expansion afforded by an established industry. These should be availed of rather than an attempt made to grow tobacco in outside areas where manufacturing companies with their field staffs and other facilities for meeting growers' requirements are not available. There is the further advantage of having the Tobacco Research Station at Riwaka, the centre of the tobacco-growing area.

Shelter

Tobacco is easily damaged by wind storms, as the leaf is heavy and succulent, and even plants not actually broken can suffer damage by continually waving about in the wind. A well-sheltered locality is essential and if the site chosen is naturally sheltered by native bush or already-established shelter trees so much the better. If the existing shelter is insufficient, no time should be lost in providing for some permanent shelter. Until this becomes effective temporary shelter may be provided by planting maize breaks about every fifteenth row across the direction of the most persistent winds.

Qualifications of Growers

Success in tobacco growing comes with experience. The operations are a good deal more involved with tobacco than in growing many annual crops, as there are included preparation of the land, nursery work (raising plants in seedling beds), cultivation and care of plants, harvesting

TOBACCO FIELD, MOTUEKA

drying, and curing the leaf, and finally grading and preparation of leaf for sale. Even a person with good agricultural experience is advised to undergo a period of training before undertaking a tobacco-growing venture. A full year's attachment to an experienced grower should provide the prospective planter with a good understanding of the various operations, and if he is able to employ experienced assistance he should meet with success.

Selection of suitable land is most important. Reference should be made to the soil maps prepared by the Cawthron Institute to ensure that the soil groups recommended for the production of flue-cured leaf are present in sufficient area for the intended project. A search for a suitable area should be undertaken during the period of training, and at the same time a study should be made of tobacco diseases, factors which influence their spread, and control measures; also of the results of experimental work already carried out in fertiliser quantities, proportion of ingredients, and method of application.

An Economic Unit

In producing flue-cured leaf it is the general practice, and a desirable one, to relate acreage grown to kiln capacity. A single kiln of standard size will provide for 8 acres of tobacco producing 8,000lb. of dried leaf. Such a unit is estimated to be of sufficient size to provide a reasonable living for the average family. Sufficient land should be acquired to have at least 8 acres under tobacco each year with another 4 acres or more of additional land for rotational cropping, grazing for a cow and horse, the cultivation of a vegetable garden, and possibly some small cropping which may be undertaken to supplement the income from tobacco if that can be done without prejudicing the tobacco undertaking.

The Burley type of tobacco, which represents only a small percentage of the tobacco grown in New Zealand, is air-dried, and as kiln capacity does not have to be considered, the area is limited only by the labour available to handle the crop. In practice 1 to 4 acres is grown as a sideline to some other farming activity.

Tobacco growing is often associated with the growing of hops or small fruits, dairying, and sheep farming, the supply of seasonal labour governing the success with which these other interests may be worked in.

Tobacco being an annual crop, full production is reached in the first year. The prospective grower should be in possession of his land before July to enable him to arrange a contract, prepare land and seedling beds, to allow sufficient time for erection of a kiln and bulking shed, and to have everything under way in time.

Land for tobacco growing varies greatly in value, and in favoured localities is sought after at a figure in excess of its value for other types of farming. An average of £65 per acre is a generally-accepted figure. Buildings used in the production of the crop (not including the dwelling, which will cost up to £1,500) account for a substantial amount of the establishment cost—as much as the land itself.

The following is a detailed estimate for an economic unit:—

	£	£
Land:		
12 acres at £65		780
Buildings:		
House	1,500	
Kiln	300	
Grading shed	300	
Lean-to shelter	50	
Other shed	150	
		2,300
Implements		90
Sundry tools		10
Horse and harness ..		45
Sundry appliances ..		60
Total		£3,285

This estimate is based on the assumption that no heavy implements are provided and that heavy ploughing will be done by contract and inter-row cultivation by horse. On larger undertakings of sufficient size to warrant the installation of complete equipment a tractor and tractor implements for preparation of land and inter-row cultivation, mechanical hoers, and planting machines can be employed to advantage and should be regarded as essential equipment.

As an Occupation

Tobacco growing is a very intensive form of farming and uses a considerable amount of labour right from the time pricking out of seedlings commences (about mid-September) until grading is finished, often as late as the end of August. Much of the work is of a light nature, but can be tedious and tiring, and is carried out by a large proportion of female labour. Female labour is employed largely in pricking out seedlings, topping and removing laterals, passing and tying of leaf during harvesting, and finally the grading of leaf at the end of the season, which is done indoors during the colder months. Much of the other work, including planting, hand hoeing, and harvesting leaf, uses a greater proportion of male labour. These operations, often carried out in hot, dry weather, can be tiring for the average person, but quite a number of women and girls will undertake hand hoeing. There is perhaps no form of farming which does not provide hard work at times, and this applies to tobacco growing. Nevertheless, on account of the amount of relatively light work involved, the industry can provide much employment for females and persons slightly lacking in physical fitness, but who can accommodate themselves to work of a rather tedious nature and enjoy working outside in sunshine and heat.

[*Green and Hahn photo.*

BULK DISTRIBUTION OF LIME

AS a result of the increased use of lime, existing methods of distribution from works to farm and of spreading it on the farm have frequently proved inadequate. Faced with such difficulties, Mr. C. Gardner, of Waiau, North Canterbury, evolved a plan to meet his requirements, and in this article R. H. Scott, Field Economist, and C. J. Crosbie, Assistant Machinery Officer, Christchurch, describe the methods being adopted.

THE farm is located on the north bank of the Waiau River, about 10 miles from Waiau township, and a fair proportion of it comprises rolling downs country. The spreading of the considerable quantities of lime required on this type of country proves a problem. Faced with this and acting on the assumption that bulk methods of handling lime from works to farm would eventually come, Mr. Gardner approached the matter from two angles; first, that some container would have to be provided to hold a reasonable quantity of bulk lime and which could be hauled from paddock to paddock; and second, that a new type of bulk lime distributor would have to be designed with a capacity of from 2 to 3 tons and which would work satisfactorily on the hilly country. A primary factor in deciding on the quantity to be carried was that 3 tons is about the limit load that can be handled by the average farm crawler tractor on steep faces.

After the nature of the plant required had been decided two Christchurch engineering firms were consulted and arrangements made for the building of a mobile bulk lime bin and ramp and a bulk distributor.

The plant, all of which is mobile, may be considered under three headings:

The Bulk Lime Bin

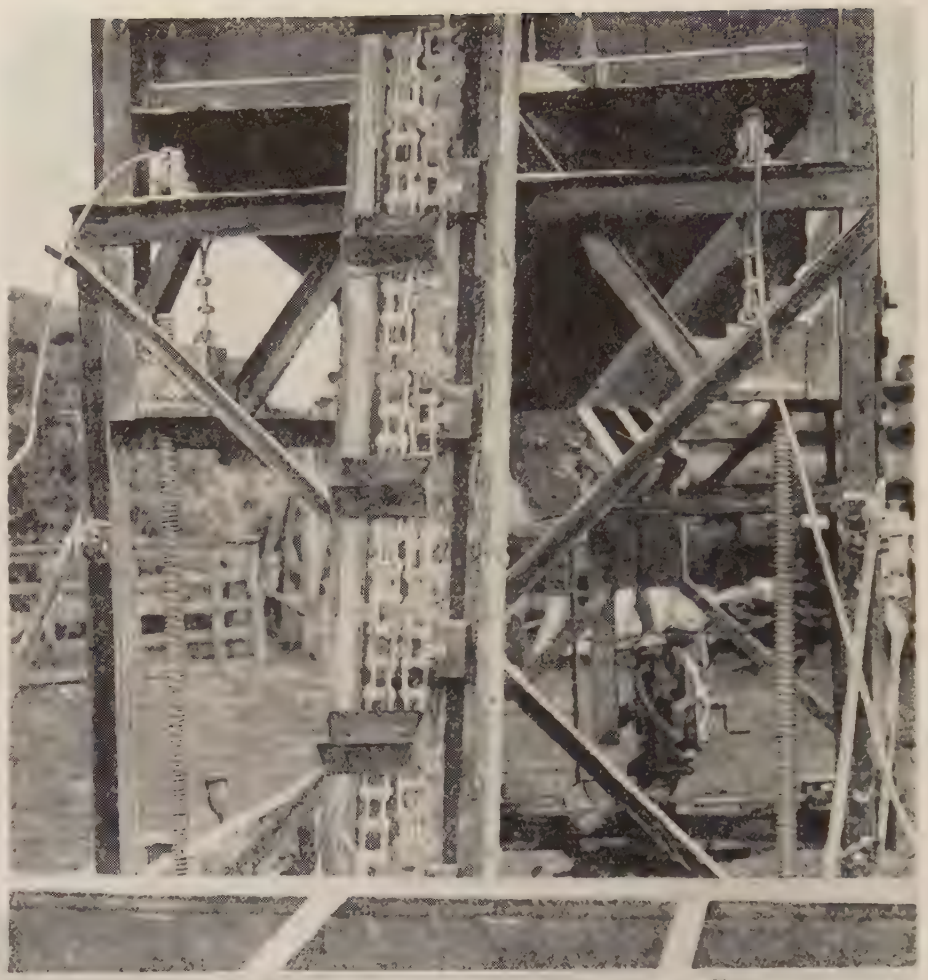
The bulk lime bin, made from an old shingle hopper, holds 20 tons of lime in its three compartments. It is mounted on four wheels, formerly front wheels of a traction engine, the front axle being fitted with a drawbar and a full-swing turntable. The framework of the bin is constructed from channel iron girders and is suitably braced and cross-tied. An interesting feature is that the bin is raised and lowered within its framework by four large worm shafts, so that the unit has a much lower centre of gravity when travelling and the danger from striking power lines and trees is obviated. Holes are provided in the bin framework so that the bin can be

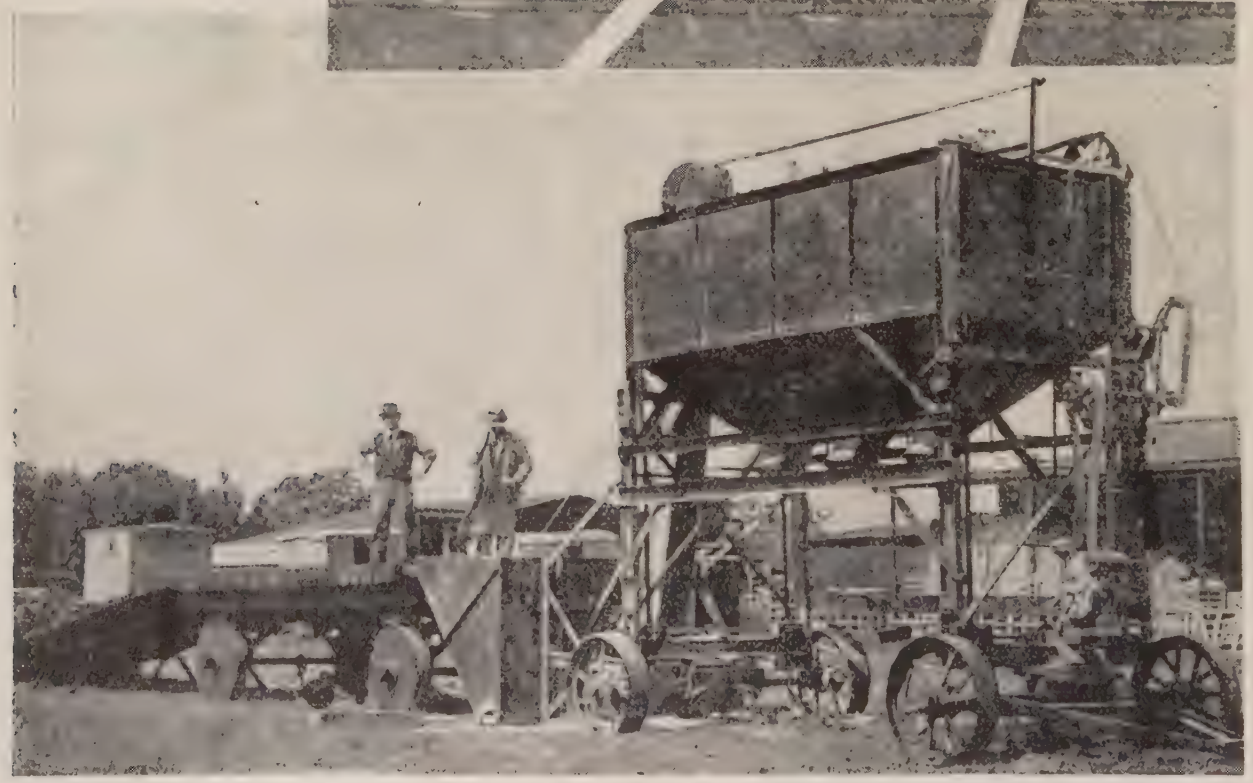
BULK HANDLING OF LIME

Fig. 1, Right — The wooden chute prevents slap in the bucket conveyor and returns to the hopper any lime overcarried. The large worm shafts move the bin to its "up" and "down" positions.

Fig. 2, Below — The portable lime bin showing the receiving hopper at one end against which is placed the portable loading platform. The plant will be arranged in this manner to take lime when it is brought to the farm in bulk.

[*Green and Hahn photos.*



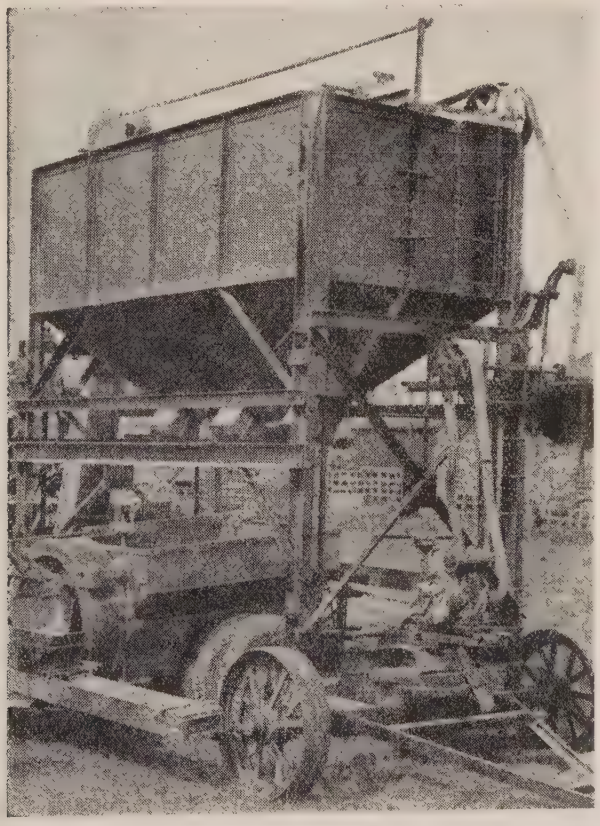


bolted in its "up" and "down" positions to give greater rigidity to the unit and to take the weight from the worm shafts.

A primary receiving hopper sufficient to take a 5½-ton load of lime from a truck has been fitted to the back of the bin framework in such a way that it can be lifted up and down, using the back axle of the unit as a pivot. A right and left hand screw conveyor shaft at the bottom of the bin moves the lime to the centre, where it is picked up from a port by a bucket-and-chain conveyor belt and elevated to the bin. Viewed from an end the bin is "V" shaped to ensure that the lime will empty out completely, and the screw conveyor in it is bridged with a wooden grid to control the rate at which the lime is delivered to the bucket elevator.

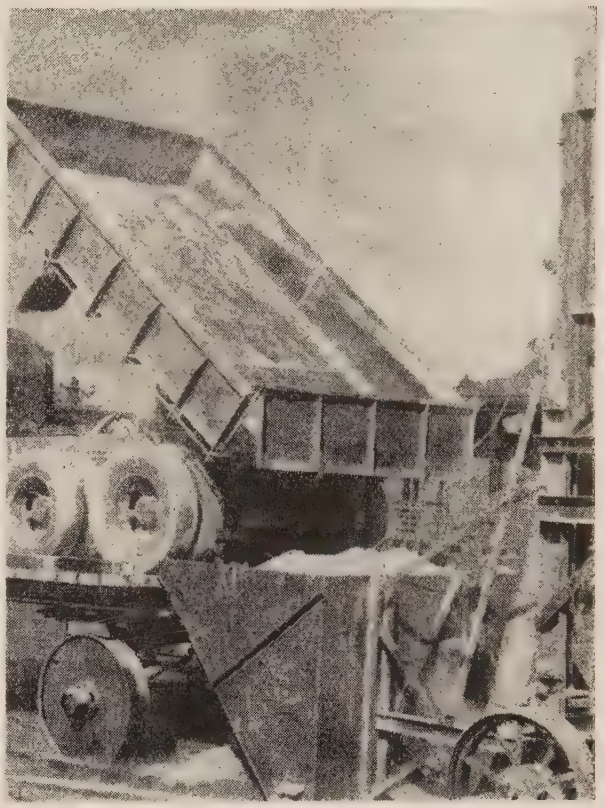
A wooden chute attached to the rear of the framework of the bin prevents slap in the bucket elevator and also returns to the hopper any lime overcarried. The lime on delivery from the bucket elevator fills the first compartment of the bin, the surplus being scraped into the second and third compartments by scrapers fitted to an endless chain which is arranged across the top of the bin. Three ports with manually-operated cut-off doors deliver lime from the three compartments to the bulk lime distributor, which is backed under the bin.

Power from a 5 h.p. petrol engine mounted on the front of the hopper framework is ample for the unit. By linking the engine with a short belt to the elevating mechanism, power is supplied through worm gears and cogs and chain drives to the four worm shafts for elevating the bin to its "up" position; similarly by moving the engine back on its adjustable bed to allow the short belt to be crossed, the bin can be lowered. By using a longer belt, power is supplied to the scraping unit at the top of the bin, to the bucket elevator, and to the screw conveyor in the primary receiving bin. Two wire ropes (Fig. 1) arranged over pulleys are fitted to the receiving hopper and to the bin in such a way that when the bin is lowered to its "down" position the hopper is lifted clear of the ground and the unit is ready for travelling.



[*Green and Hahn photo.*

Fig. 3—The bulk distributor in position for filling. The power unit is mounted in front on an adjustable bed to allow for taking up slack in belts or crossing the shorter belt to get reverse drive.



[*Green and Hahn photo.*

Fig. 4—Lime being tipped into the receiving hopper from the ramp, part of which was an old traction engine trailer. Chocks are shown placed between the decking and the wheels to take any weight off the springs.

A rail fitted to the top of the bin (Fig. 5) provides a support for a canvas cover which is placed in position each night, as is a cover for the receiving hopper. The corners of the bin have been padded to prevent undue chafing on the covers, and the covers have also been reinforced with leather at the points where wear occurs.

The Ramp

To enable lorries to tip bulk lime directly into the receiving hopper a portable ramp was constructed. An old traction engine trailer was strengthened and lengthened by the use of two large H iron girders and a hardwood decking bolted on. The original springs were left intact to give height and width to the decking, and the retention of the full-swing turntable fitted to the front axle gives maximum manoeuvrability.

The ramp to the trailer was constructed from channel iron girders and hardwood decking, and was made in sections so that no more than two men should be needed to arrange the plant in the field. Each girder was made in three sections, each section butting the next between

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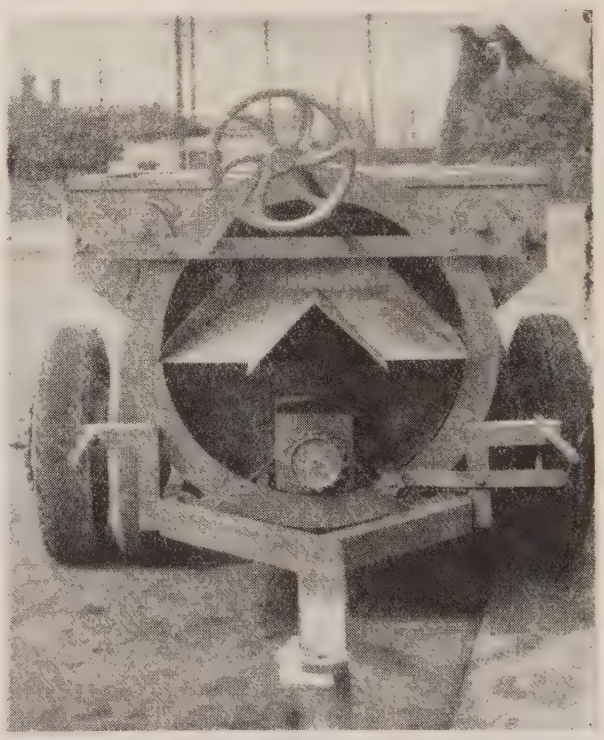

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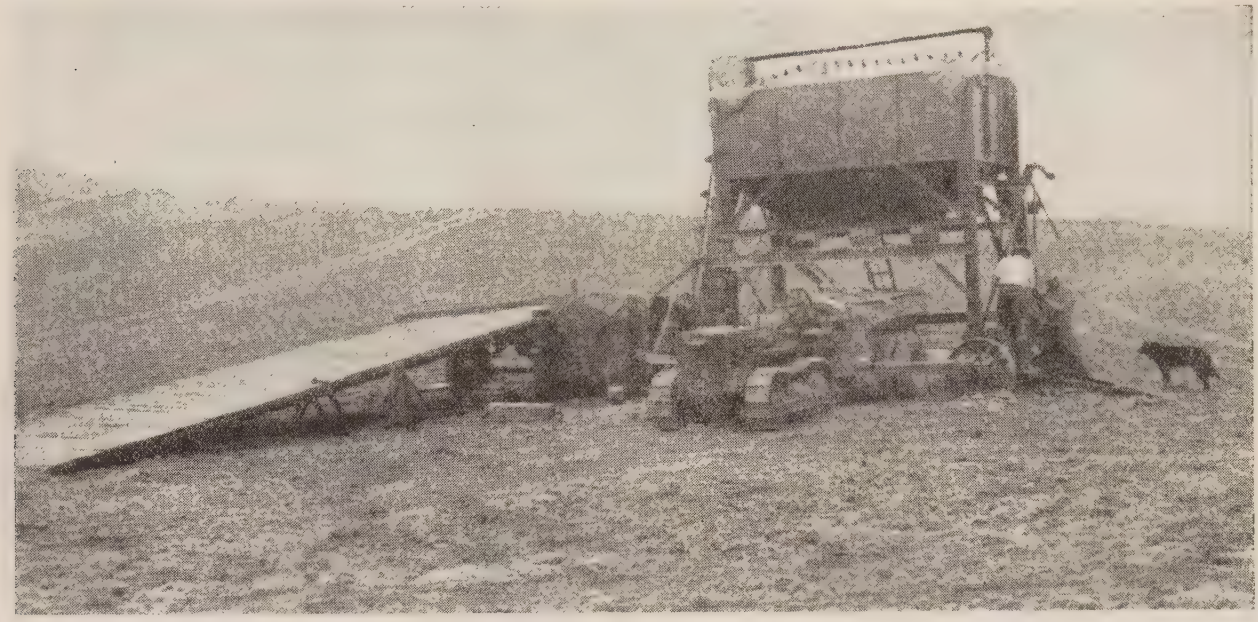

Fig. 5—The incline of the ramp is approximately one in eight. Here it is in position for the unloading of bagged lime. The endless scraper is shown at the top of the bins.

two solid plates welded to one length and secured by a large pin. The girders are supported along their length by suitably-placed supports made of angle iron which are fixed to the girders by two bolts, and the two girders are tied together with tie rods which drop into slots in heavy plates welded to the girders. The decking of the ramp has been divided into 13 sections of three hardwood planks bolted to short sections of angle iron, each section being fitted to the girders by four pins. The ramp, which is 30ft. long, has an incline of approximately 1 in 8. With the maximum use of pins the assembly and dismantling of the ramp in the field are easy and can be done in a comparatively short time. That the strength of the ramp is in no way reduced is shown in Fig. 4 where a lorry (unladen weight 6 tons 12cwt.) with a 5½-ton load of lime has been backed on to it. In the field chocks of wood are placed between the decking of the trailer and its wheels to take the weight from the springs and to give greater rigidity. The front axle of the trailer is fitted with a goose-neck drawbar to enable it to be pulled from the low hitch on the back of the portable lime hopper.

Bulk Lime Distributor

The bulk distributor is a departure from the usual methods of applying lime; it carries with it from 2½ to 3 tons of lime in a hopper and is operated in the field by one man. The hopper is carried by two sets of dual rubber tyres.

To ensure that it empties out the hopper is V shaped, and at the bottom of it is a semi-circular trough housing the worm conveyor which carries the lime forward to an elevator. An inverted V-shaped hood controls to some extent the rate at which the lime is conveyed forward and at the same time provides protection for the worm. Under this hood another V-shaped hood operated by controls within reach of the tractor driver provides the fine adjustment for the rate of delivery of the lime. These hoods can be adjusted to give a delivery of up to 2 tons per acre.

In actual practice it was found that there was a tendency for lime to bridge and lodge in the forward right-hand corner of the hopper, because the worm conveyor feeds in from the left-hand side and the lime not fed through the front port is forced to the right-hand corner. To ensure delivery of all the lime, scallops were cut in the two hoods in this corner, allowing this lime to enter the path of the worm conveyor after the main bulk has been distributed.

An elevator which is mounted in front of the hopper is of a type that may be called an "inverted paddle wheel"; it is actuated by two pairs of flanged rubber-faced rollers, another two pairs being fitted at the top to hold it in position. Rubber-faced rollers were chosen because there is less likelihood of any lime spilled on the outside of the paddle wheel building up on the faces and so jamming the mechanism.

Lime delivered by the worm conveyor through a port in the front of the hopper to the bottom of the "paddle wheel" is carried up by the vanes of the wheel and delivered on to a chute where it is fed by gravity forward and downward to the actual distributor. In this unit a 14ft. top-dresser has been fitted on the drawbar in front of the paddle wheel about 18in. from the ground, which ensures ample clearance of obstructions on the ground, yet delivers the lime as low as possible to prevent it being blown about on a windy day.

The dual wheels on one side of the unit provide the source of power through chain drives and bevel gears to the worm conveyor, which in turn passes it on through a chain drive to the two pairs of rollers which drive the "paddle wheel." The dual wheels on the other side of the distributor provide the power through a chain drive to operate the actual topdresser. All controls are within easy reach of the tractor driver.

Fitted with four 7.50 x 20 tyres, the unit leaves surprisingly shallow wheel marks on cultivated ground in spite of the load it carries. Spreading a liberal ton of lime to the acre before grassing down the unit little more than marked the ground.

OPERATION OF PLANT

Setting up and Dismantling

Dismantling the units for shifting to another field or a new set in the same field proceeds in the order be-

low. (Fig. 5 shows the ramp and portable lime bin set up ready for operations.)

1. The decking of the ramp is taken up and placed on the deck of the trailer, the sections being stacked in two piles in the order in which they were removed. The pins are knocked out of the girders and the sections of these, together with the supports, are loaded on to the deck of the trailer.
2. The wooden chute behind the bucket elevator of the bulk bin is removed and placed on the trailer.
3. The steel straps fitted between the top of the primary receiving hopper and the bin framework to give rigidity are removed, and the bin is then lowered to its down position. At the same time the wire ropes passing over pulleys between the bin and the primary receiving hopper lift the hopper clear of the ground. The bin is then bolted to its down position.
4. The trailer's drawbar, which is of such a length that neither unit need be shifted, is attached to the trailer and the rear of the bin framework, and a drawbar is fitted between the front framework of the bin and its back axle to provide a direct pull. A channel-iron brace which is removed to allow the distributior to back under the bin is replaced and the two units are then ready for travelling.

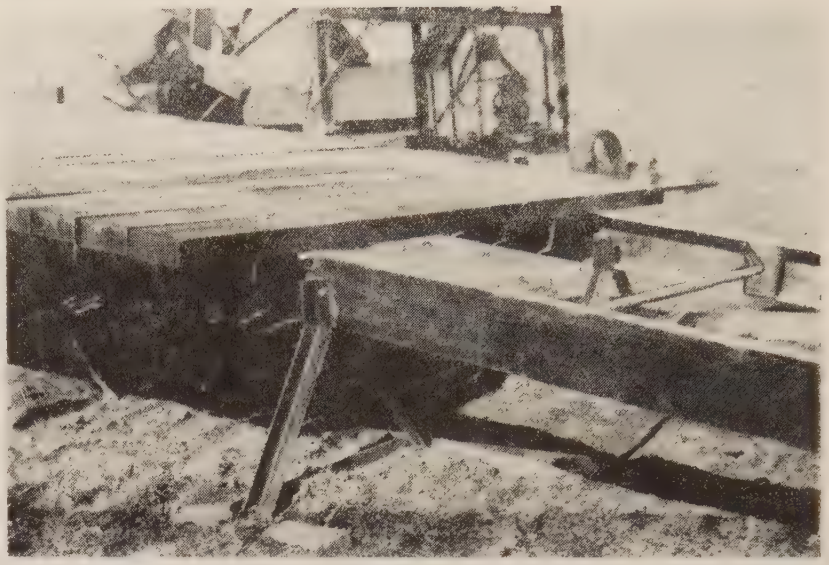

Fig. 6—The ramp to the trailer is constructed in sections to make for ease in assembling and dismantling. The angle iron supports are shown together with the cross tie rods fitting into slotted plates.

Alternatively, the above operations are reversed to set up the two units, and two men can easily perform them under an hour.

The two units were towed from Christchurch to Waiau behind a truck, a distance of 86 miles, in one day, and they can be handled easily in the field by a 30 h.p. crawler tractor.

Spreading Lime

When bulk lime is available a lorry containing it can be backed up the ramp and the lime tipped into the primary receiving hopper, which has a capacity of 5½ tons. At present Mr Gardner is getting lime in bags, and even so 5 tons can be tipped from bags on the lorry into the hopper in a comparatively short time. In Fig. 5 the ramp is shown side on to the hopper, making for easy unloading of bags of lime from a truck. If the lime arrived in bulk, the unloading of a lorry would not take more than 3 minutes; the ramp would then be in a position as illustrated in Fig. 2

The 5 tons in the receiving hopper can be elevated to the bin in about 25 minutes. The lime distributor is backed under the bin and can be filled with 2½ tons of lime and be out in the field within 3 minutes to spread its load at the rate of just over 1 ton per acre and be back for refilling in 20 minutes. This works out at about 7 to 8 acres per hour, or approximately 60 acres in an 8-hour day, representing the use of 60 tons of lime. This is about the amount that has actually been spread in a working day under average conditions at Waiau. The above performance was made with lime that had been crushed direct from the quarry without passing through a drier.

Although one man could work the three units, Mr. Gardner prefers to have one man in the field with the distributor and one man at the set to operate the bin, an arrangement which will be even more preferable when lime is

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readily available and several trucks are carting to the set.

The distributor with a full load can be handled with ease on fairly steep slopes with a 30 h.p. diesel crawler tractor.

Method in the Field

As the areas of paddocks on Mr. Gardner's property of "Emu Plains" are greater than is usually found in Canterbury mixed farms, he arranges the plant so that a paddock can be worked in sections. This was the method employed in a 280-acre paddock when the writers saw the plant working from one set, where the bin was originally assembled.

The size of the sections enables the distributor to make a complete circuit of the outer portion and return to the bin before the distributor is completely empty, thus eliminating dead running. Even when a section is nearly completed the dead running between the set and the centre of the section is at a minimum.

Step in Right Direction

There are still difficulties with the plant to be overcome, but none of these is very great. One difficulty is that on a slope the flow of lime is slightly greater on the downhill arm of the topdresser than on the upper part, but this point can be remedied, and adjustments found necessary to the chute feeding the topdresser will also be made.

All the equipment has been well made and is a credit to the makers and to Mr. Gardner's initiative and ingenuity.

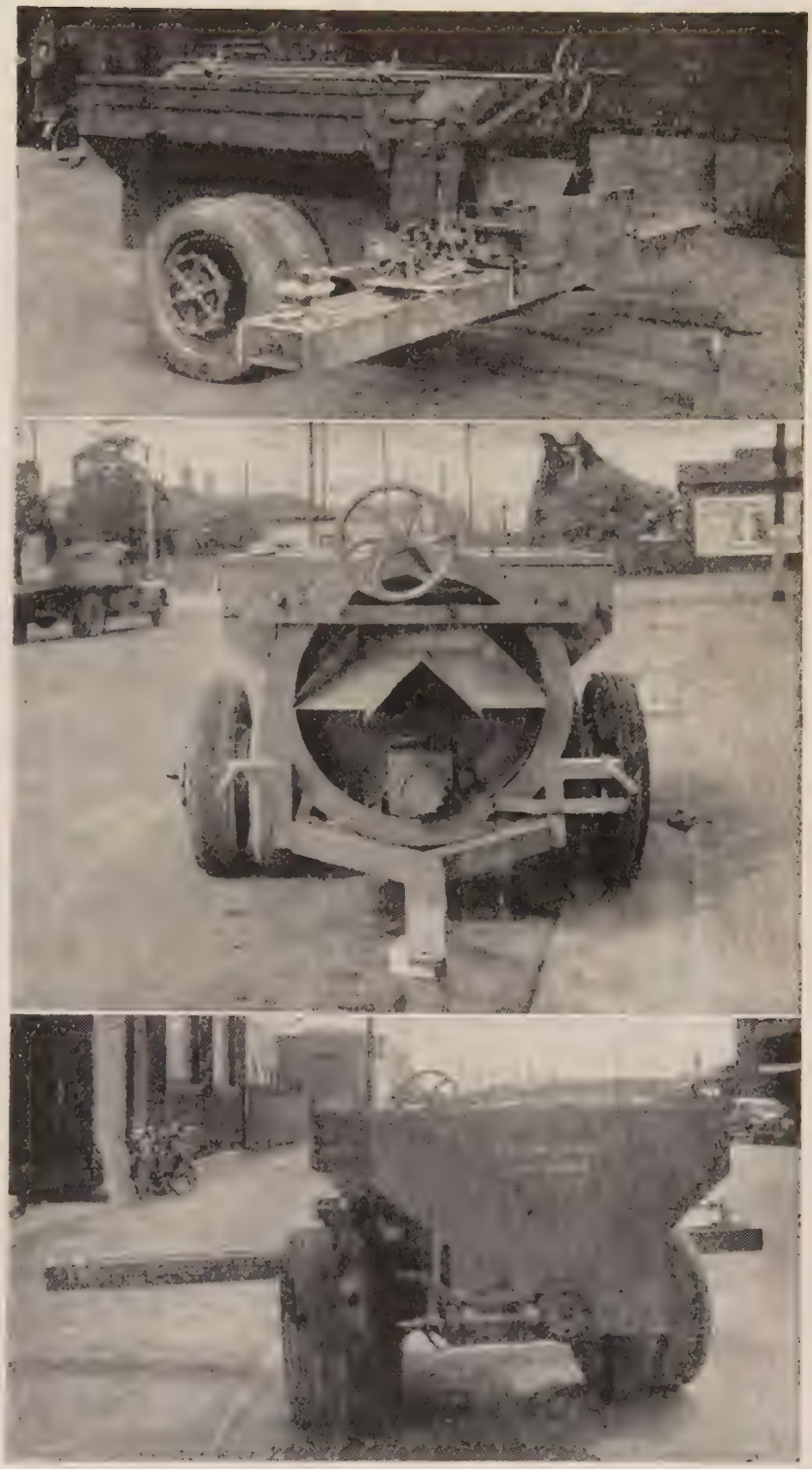
He fully appreciates the benefit of lime and plans to use considerable quantities, and is firmly of the opinion that bulk methods of handling must come and the bagging be partly eliminated.

With Mr. Gardner's equipment and bulk lime available, a truck could load from the bins at the works, drive on to the farm, unload direct into the primary receiving hopper of the bin, and return for a further load. At the set the lime is dealt with by mechanical means so that at no stage, from works to the actual spreading on the paddock, need there be any manual lifting and the dust and unpleasantness usually associated with using lime are very largely overcome.

LUCERNE

Lucerne is a forage crop of such outstanding merits that it should be used more freely in New Zealand. Bulletin No. 155, "Lucerne," outlines the features and the methods of managing this crop. Write to the Department of Agriculture, Auckland, Wellington, Christchurch, or Dunedin, for this free bulletin.

THE LIME DISTRIBUTOR



[*Steffano Webb photos.*

Upper—The body of the hopper is constructed of ¼in. plate. Middle—The elevator attached to the front of the hopper which may be called an "inverted paddle wheel" is worked by two pairs of rubber-faced flanged rollers. The chain drive from the front of worm conveyor to the rollers is also shown. Lower—The bevelled gears which drive the worm at the bottom of the hopper.

★ SEED POTATOES ★

[Green and Hahn photo

THE CHOICE AND CARE OF SEED POTATOES HAVE A LARGE BEARING ON THE YIELD OF THE SUBSEQUENT CROP.

Choose a variety which is known by experience to be suited to the soil and climate of your district, or one which is recommended by the local Instructor in Agriculture.

Choose Certified seed. This is the progeny of crops which have been inspected and found to be reasonably free from diseased plants and foreign varieties.

A perusal of the "List of Growers of Provisionally Certified Crops" will indicate your nearest source of supply. This list is obtainable on request from your local office of the Department of Agriculture.

When contacting a grower for requirements of Certified seed potatoes specify the size of seed (i.e., the grade) which you wish to purchase. One may nominate, say, a grade of two to four ounces, and the official tag attached to the sacks will confirm the grading when the seed potatoes are delivered.

During storage seed potatoes should be periodically inspected up to the time of planting. Potatoes are perishable produce and an odd damaged or blighted tuber may infect others during a period of storage in sacks. It is worth while for the small grower to crate and sprout seed before planting.

FARM WORK FOR AUGUST

By the Fields Division

PASTURES

Poached Land.—Land which has been poached badly because of wet weather during the winter is best repaired by rolling with a light Cambridge roller. This levels out the ground and presses the grass and clover back into position so that the turf will reknit satisfactorily. Harrowing and discing later when the ground is dry only destroys the grass and leaves patches of bare ground.

* * *

Spring-sown Pastures.—Last month farmers were advised to deep plough for spring sowing of pastures. As the ground dries out it should be cultivated with discs, cultivators, and harrows until a very fine and firm seedbed is obtained. On light soils the land will require rolling before and after sowing, which in mild climates can take place on such soils this month.

HAY AND SILAGE

Heavy feeding of hay and silage will continue throughout the month. Farmers should remember that patches of gorse and blackberry may be cleaned up by concentrating the feeding of hay on such areas; the ground will become trampled and reseeded by seed from the hay.

* * *

The season is again approaching when most dairy farmers must decide which fields they are going to close for silage and hay for the coming year. The date of closing will depend on the locality and the season, and is usually governed by the grass growth; when it is beginning to get ahead of the stock action must be taken and the selected fields prepared for closing. In normal seasons the closing date is usually during the middle or the third week of September.

The first essential is to make sure that all rubbish such as sticks, tree branches, matted hay and silage, and possibly pieces of old baling wire, are removed to prevent blockages and hold-ups with the mowing machines later on.

The field should be topdressed with fertiliser, if available, and then thoroughly harrowed, preferably with a good chain tripod pattern of harrow. If the land poaches during the winter it will be advisable to give two strokes in opposite directions to even up the surface, tear up the hard cow pats, and spread the soft animal droppings as efficiently as possible. If badly poached the land will require rolling to level the ground and reknit the turf. The rolling is most effective when the soil is thoroughly saturated.

Finally, close and securely fasten the gate to prevent it being left open.

LUCERNE

Complete the feeding-off of roughage on lucerne stands early in the month. Ground ploughed in the autumn for establishment of new stands should be cultivated as soon as the land is dry enough. Land not yet ploughed for lucerne establishment in November should be ploughed as soon as possible so that there is a sufficient period of fallow to prepare the soil for the crop and destroy weeds.

CEREAL GREENFEEDS

Areas of greenfeed oats the grazing of which is finished may be shut up for provision of a chaff or grain crop provided that the area has not been subjected to severe grazing during the winter.

Land for greenfeed millet and greenfeed maize in the North Island should be deep ploughed this month. Areas of oat and barley greenfeed, where the grazing is finished and from which it is not intended to produce the grain or chaff crop, should be ploughed for further use.

ROOT AND CRUCIFEROUS CROPS

Remnants of swede and chou moellier crops should be fed off in August in most districts. This is the chief month for feeding mangolds, which may be fed six weeks after pulling. Deep plough now for spring-sown crops. As advised in the notes for June, if the land was in pasture it should have been skim ploughed then Such land should now be disced to pulverise the turf before deep ploughing. If the turf has not been skim ploughed it should be disced before deep ploughing this month so that it will not interfere with the working-down of the land. Light land should be rolled after deep ploughing, particularly where surface working has not been carried out. Where the land is dry enough after deep ploughing, working it with cultivators, discs, and harrows should be started.

POTATOES

Pick over potatoes for selection of seed. It is better to crate these so that the sprouts are not destroyed before planting out. Land intended for potatoes should be deep ploughed, and land already ploughed should be cultivated as soon as the soil is dry enough.

CEREALS AND PEAS FOR GRAIN AND CHAFF

Forward cereal crops should be fed off. Areas of cereals affected by grass grub should be rolled to firm the roots and permit recovery. Deep plough areas intended for barley, peas, or maize for grain. Sow spring oats and spring wheat this month on a fine and firm seed-bed.

STOCK

The feeding of supplementary feed to dairy cows should be very heavy this month. Early litters of pigs will be ready for weaning. Stores that have been wintered will require fairly heavy feeding with separated milk. Generally it is preferable for such stores to be made into baconers.

GENERAL

In cold districts the land should be prepared for tree-planting during this month. Pampas grass should also be planted in areas where frosts are too severe for autumn or winter planting. Finish repairing implements, hedge-cutting, and all the odd jobs, because next month will be a busy period for most farmers.

Young Farmers' Clubs Notes

FOR some years the activities of the Young Farmers' Clubs Federation have been reported in a special section of the "Journal of Agriculture." From and including this issue the Y.F.C. notes will no longer be an integral part of the "Journal," but will be printed as a special 8-page supplement, which will be inserted in the "Journals" of Y.F.C. members only.

"Journal" subscribers who are not Y.F.C. members but are interested in the federation's activities and wish to receive the clubs' supplement may apply to the Y.F.C. Dominion Organising Secretary, Box 3004, Wellington, for inclusion in the mailing list.

SHEARING MACHINES

Bulletin No. 234, "Shearing Machines," will be of value to shearers and farmers with their own shearing plants. It gives a detailed description of the shearing plant, and the different handpieces used in New Zealand. This bulletin will teach the shearing machine owner how to maintain and repair his plant. This bulletin is available free from the Department of Agriculture, Auckland, Wellington Christchurch, or Dunedin.

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PLANT & SPRAYS FOR ORCHARD DISEASES

By A. R. GRAINGER, *Orchard Instructor, Christchurch.*

WHILE in most orchards growers will still be occupied with pruning, the time for other important orchard operations, such as spraying, grafting, and cultivating, is rapidly approaching. Within the limits of the winter or dormant period pruning may be carried out at any time weather conditions permit, but though spraying must be done to a time-table it is not always done to the calendar.

AS these notes cover the work in orchards throughout the Dominion, the time for the carrying out of an operation is generally stated in terms of condition of bud development or tree growth and actual dates are neither desirable nor necessary.

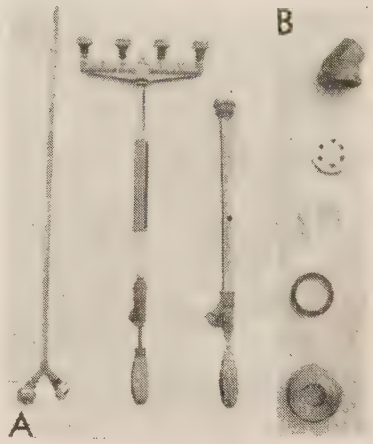
The greatest single factor affecting the income of the commercial orchardist is effective disease control, which necessitates not only the application of protective sprays to prevent insects and diseases from gaining a foothold on the trees and fruit, but also spraying to kill pests and diseases which have become established in the orchard. Other methods such as the cutting out of portions of wood infected with fireblight, powdery mildew, borer, plum canker, or silver blight are also important.

Efficient Spraying Plant

Spraying plants vary from the light portable to the stationary and the "crawler" outfit. Each type has its advantage under certain conditions, and the problem of which is most suitable should be investigated in the field.

A spray outfit should receive a thorough overhaul each year before seasonal operations begin. Attention should be given to working parts such as drive coupling, agitator shaft and blades, piston packing, valve seats, balls, etc., pressure regulator or release valve, drain plug, overflow pipe and strainer, rubber hose and connections, and spray rods or guns. Discs should be examined and openings checked against recommendations, which, for cyclone nozzles are 4/64in. for winter spraying and 5/64in. for summer, and for spray guns 6/64in. in winter and 8/64in. in summer. Noticeably worn discs should be replaced. If the pump is petrol driven, overhaul is particularly desirable to prevent, as far as practicable, a hold-up when spraying is in progress. Check compression, ignition, carburettor, governor, bearings, etc., and have adjustments made where necessary.

In piped orchards any noticeable loss of pressure may indicate that a clean-out of the pipes is required, but an examination of a section of pipe is a more reliable guide. Should a heavy deposit of material appreciably reduce the internal diameter of the pipe, a clean-out is advisable, the recommended formula being as follows:—Fill the piping system with commercial hydrochloric acid diluted with water at the rate of one gallon of acid to 19 gallons of water. Leave this in the pipes for an hour, then pump water through the system until the acid has been removed and all loosened material is ejected. **Warning**—Hydrochloric acid is liable to damage cylinder walls of the porcelain-lined type of pump, and the liquid should not be put through pumps of this nature but be introduced to the piping system by the use of a portable hand pump connected up so as to by-pass the main spray pump.



Spraying apparatus: A, from left—"Y" for rods and four- and one-nozzle spray guns. B, top to bottom—nozzle and movable parts—cap, washer, disc, and whorl plate.

Crawler type spray outfit.

Pests and Diseases

San Jose scale (*Aspidiotus perniciosus*) attacks all pip and stone fruit trees and also hawthorn, being found on both wood and fruit. It multiplies very rapidly and, although comparatively small, by force of numbers it is capable of killing heavy branches if not eradicated. It is circular to elongated in shape according to sex, about the size of a small pin head, and is grey with circular bands of darker colour and a central grey dot. When squashed by pressure live scale may be distinguished by a yellowish moist appearance. Where San Jose scale is known to be present the trees should be sprayed in the dormant period with winter oil **5** per cent. (one of oil to 19 of water if oil content is 100 per cent.).

Red Mite. *Paratetranychus pilosus*, the European mite, is the variety most prevalent on apples and pears, but sometimes *Byrobia praetiosa*, the clover mite, has been in evidence. The adults are best controlled in the summer, but should there be a heavy deposit of the reddish winter eggs on the wood, clustered around spurs and buds, it is advisable to spray in the dormant period with winter oil 5 per cent. as for San Jose scale.

Peach Aphis. The overwintering eggs of peach aphis are laid on the young wood near the fruit buds, and

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unless a winter oil 5 per cent. is applied in the dormant period there may be an infestation of the adults on the young shoots in the spring.

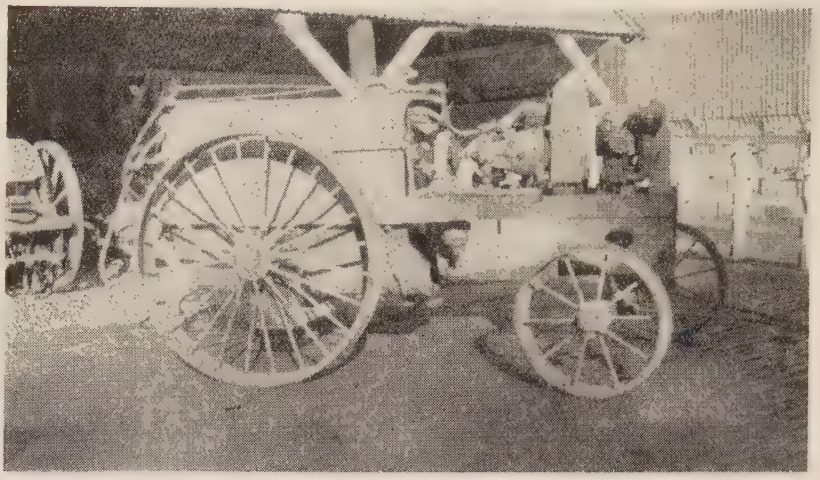
Fungous Diseases of Stone Fruit—Leaf Curl, Bladder Plum, Die back, Shothole. Sprays against fungous diseases are preventive, as once infection has entered the plant tissue little can be done to eradicate it, particularly leaf curl and bladder plum.

Control. Spray with Bordeaux mixture 5-4-50 at bud movement of the leaf buds (generally at the first sign of colour in the blossom buds). Under cold damp conditions or in the case of highly susceptible varieties a second spray of Bordeaux 3-4-50 should be applied at pink blossom stage.

Preparing and Mixing Sprays

Winter Oil. The mixing of winter oil is liable to be affected by the nature of the water used and the cleanliness of the spraying apparatus. A watch should be kept for large globules or patches of free oil coming to the top of the mixture. If this occurs, the emulsion has broken up and some trees may be sprayed with water only instead of oil. There is a tendency for the operator to blame the manufacturer of the oil, but if he is using a product certified by the Plant Diseases Division, he should look to his own methods for the cause of the failure of the oil to remain as an emulsion.

The "red" types of winter oil generally require care in mixing, and apart from using clean apparatus they should be prepared as follows:—To the required quantity of winter oil add half the volume of water. Stir briskly until a white paste is formed. Add water until a thin cream is produced, and then add to the bulk of the water in the tank with the agitator going and mix thoroughly.



Wheeled type of spray plant.

Bordeaux Mixture. Some fruit growers still use old-time formulae for preparing Bordeaux mixture, but the following are standard recommendations of this Department:—

5-4-50 at bud movement or green tip stage.

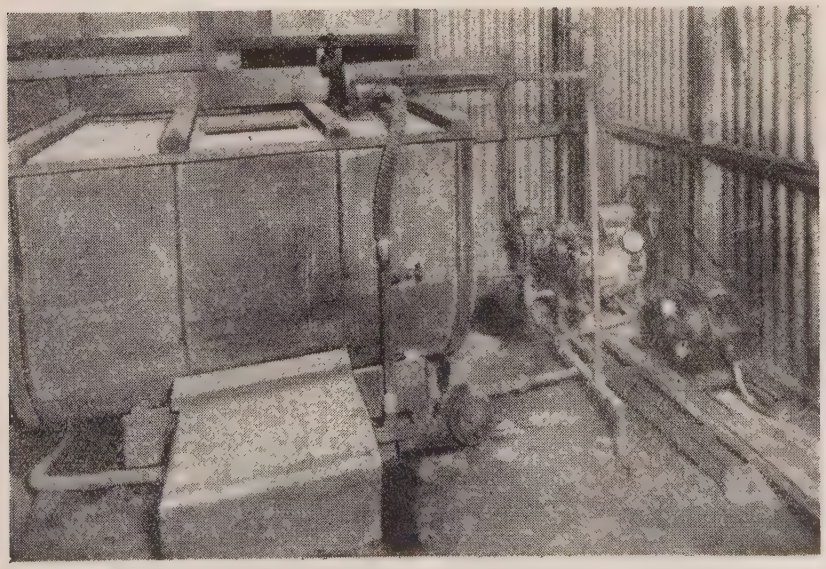
3-4-50 at pink stage and early spring.

1½-2-50 as a late summer application.

Hydrated lime is the most convenient, but it must be fresh each season, as if it is left exposed to the air for some time, part of it may revert to the carbonate form, which is useless for spraying purposes.

Dissolve the bluestone and pour and stir into the bulk of the water. Cream up the lime in a little water, adding more until the bucket is full, then pour it into the diluted bluestone in the tank while the agitator is running. Bordeaux mixture should be used soon after mixing and should not be left in the tank overnight.

Lime Sulphur. An insecticide as well as a fungicide, lime sulphur is used in place of Bordeaux on kinds and varieties of fruit liable to damage by Bordeaux. Lime sulphur if used at too high a concentration is also liable to scorch tender varieties of apples such as Cox's Orange. A few years ago when it varied in polysulphide content according to the brand or manufacture, dilutions were recommended in terms of percentages of polysulphides. Now that all the brands certified are of an approximate polysulphide content of 15 per cent., the dilutions may be given as 1-15, 1-30, 1-60, 1-120, 1-160, these being for stages of growth ranging from green tip to full summer foliage.



Stationary spray plant. [*Green and Hahn photo.*

Spraying Programmes

The fruit grower should map out a series of spraying programmes for his orchard, one for each kind of fruit, and also, in certain circumstances, separate ones for different varieties of the same kind. The reasons for this are that spraying materials have to be ordered in advance, while applications have to be made at certain stages of tree growth, so that unless a definite plan has been formed in advance, the critical stage may pass before the sprays are applied.

It may be found impossible to keep strictly to the original programme owing to the intervention of unsuitable weather resulting in the appearance of some additional pest or disease, but the programme should still remain the foundation of disease control, with only slight modifications.

In the spray programme on the next page the time for applications is given in stages of tree growth, not in calendar dates.

ORCHARD DISEASES

The programme given for stone fruit is a general one, and the following additional or substitute applications may be necessary:—

(a) **Apricots.** Instead of sulphurs in Nos. 3 and 4 substitute Bordeaux 3-4-50 and 1½-2-50 respectively.

(b) For control of black or green aphis use nicotine sulphate 40 per cent., 1-800 (1 pint to 100 gallons) plus 4lb. soft soap if used alone, or without soap if combined with lime sulphur. Spray thoroughly into the clusters of aphides.

(c) For control of pear slug and leaf roller caterpillar use acid lead arsenate 1½lb. to 100 gallons on cherries and English plums, and add hydrated lime 3lb. to 100 gallons if combining with lime sulphur. Other stone fruit such as peaches and Japanese plums are liable to severe leaf scorch and defoliation if sprayed with acid lead arsenate, and basic arsenate should be used on these kinds. If it is unobtainable, summer oil 1-100 or nicotine sulphate 40 per cent. as in (b) may be used. Do not spray cherries with arsenate of lead within three weeks before picking time. Either wait until after harvest or apply the summer oil if pear slugs are becoming too numerous for spraying to be delayed. There are indications that summer oil 1-100 applied to cherries shortly before harvesting will reduce the cracking of fruit which often occurs after rain.

(d) In the warmer districts (North Island) lime sulphur is liable to scorch and defoliate peach trees if applied in the summer, and under these circumstances it should not be used alone from fruit set onwards.

The only application required during July is the dormant application of winter oil for the control of scale insects and red mite. A 4 per cent. to 5 per cent. concentration should be applied.

SPRAY PROGRAMME FOR STONE FRUIT

No.	Time of Application.	Spray to Use.	Remarks.
1	Dormant period	Winter oil 4% to 5%	Control of scale insects. Aphides (egg stage).
2	Bud movement	Bordeaux 5-4-50	Control of fungous diseases, such as leaf curl, bladder plum.
2a	10 days later	Bordeaux 3-4-50	Apply in wet seasons or on varieties which are highly susceptible to fungous diseases.
3	At fruit set 14 days after petal fall.	Lime sulphur 1-160 plus colloidal sulphur 40% (2lb. to 100 gallons).	Control of fungous diseases.
4	3- to 4-week intervals until fruit is mature.	Repeat No. 3	Control of fungous diseases.

Orchard Records

THE recording of activities carried out in an orchard is a sound business practice and assists in efficient management. Little time is required to note such important points as spraying dates, mixture and quantities used, weather at the time of spraying; date of manurial applications and quantities applied; production figures from each block or variety, and dates of cultural operations. From such records the owner may find ways to improve his management, draw up a sound working programme for the coming season, and place orders with confidence for supplies of materials.

Keeping records of working costs and cash receipts from each variety or block, and examining these records from time to time is the dependable way of ascertaining whether any portion of the orchard is uneconomic, and that should be known by every orchardist.

HARVESTING APPLES AND PEARS

The preparation of apples and pears for market calls for careful methods and practice. Full information concerning the picking, packing, storage, and shipping of these fruits is given in Bulletin No. 253, "Harvesting and Packing the Apple and Pear Crop for the Home Market." This bulletin is obtainable free from the Department of Agriculture at Auckland, Wellington, Christchurch, and Dunedin.

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SPRING SOWING OF PASTURES

By C. R. TAYLOR, *Fields Instructor, Rotorua.*

THE months of September and October usually offer the best opportunity for successful spring sowing of pastures. Generally at this period there is sufficient moisture and warmth in the soil to ensure satisfactory germination and subsequent growth of the young seedlings. Provided the preparation of the seed-bed has been thorough, spring sowing in a normal season allows the pasture species a good chance of competing with annual weeds, and facilitates the formation of a dense sward of herbage before the onset of dry summer weather.

SPRING sowing of pastures, particularly in the North Island, is not favoured, as it is felt that the hazards of weed competition and the effects of hot, dry weather to follow are risks not generally warranted. However, in some circumstances (e.g. following the winter grazing of a root crop) many farmers prefer to attempt a spring sowing rather than allow the land to lie idle for six months, or even to take a catch crop from it. This applies especially to those districts which experience early frosts and rigorous winter conditions, such as the central parts of the North Island.

The spring sowing of pasture is far more widely practised in certain South Island districts, and, just as there are good reasons for preferring autumn sowings in the north, so are there also sound ones for the frequently-practised spring sowing of pastures by southern farmers. One of these is the dryness of soil conditions in the autumn, when sowing should commence, and the severity of winter frosts a little later on. The chief reason, however, is that after the spring cultivation of autumn-sown cereals and during the sowing of rape or spring-sown barley an opportunity is given to sow pasture. While this practice saves extra cultivation and advances the sowing date of pasture by some months, the sole of grass is not usually as good as when the pasture is sown alone after the period of cropping is completed and at the time most suitable for pasture establishment.

It is good practice to disc to break down the furrow.

Sowing the seed and covering with the harrows can be conveniently carried out at the same time.

Spring-sown pastures are commonly attempted as follows:—

1. Sowing with or without a cereal in the early spring, or at the time of spring cultivation of an autumn-sown cereal;
2. With rape; and
3. With swedes or soft turnips (mainly in pumice soils of the North Island).

Since it is usually of major importance to time correctly the sowing of the crop, it is obvious that pasture sown with it has more or less simply to take its chance. If the crop is a good one, the young pasture will suffer to a certain extent from abnormal competition, overshading, and, in certain instances, excessive grazing and trampling by stock. With a straight sowing of spring pasture, however, there is no need to watch the interests of another crop, and consequently full attention can be given to the particular requirements of the pasture.

Short-rotation Pastures

In districts where arable farming is carried out the short-rotation pasture has been developed to dovetail into crop rotations. Consequently, it is usual for either a mixed pasture of this type, or simply red clover in many cases, to be sown with a cereal in September, or oversown in an autumn-sown wheat crop during the spring cultivation of the crop. Again, the same kind of pasture may be successfully established in November, along with rape or root crops where these are sown on the flat. When sowing with a cereal crop, the cereal should be drilled first, and the land thoroughly rolled before sowing the grass seed and manure. Finally, brush-harrow lightly and re-roll.

These methods of establishing pastures, although for the most part satisfactory, are apt to react to the detriment of the sward if some care is not taken. Consideration should therefore be given to the possible smothering effect of the companion crop, and also the likelihood of its robbing the young pasture seedlings of necessary light.

moisture, and plant food. Of the cereals grown, oats are probably the most harmful in this respect, and barley the least. Rape, if sown too heavily on strong land, can prove a definite menace to spring grass sown with it, and the same applies to swedes and turnips. To make a success of a dual crop it is necessary to give each of its elements the degree of consideration that the compromise permits.

Permanent Pastures

Permanent pastures which are spring sown are generally best laid down without any additional constituent to act as a cover crop. If sown at the proper time on well-prepared land, the grasses and clovers should get away to a good start without the aid of an associated crop to nurse them along. In fact, these cover, or "nurse" crops as they are sometimes called, often bring about such permanent weaknesses in the sward as to cause serious loss of herbage during the life of the pasture. Should it be found necessary to sow permanent pasture with a companion crop, the pasture must be given first consideration if the weaker, slower-growing species of the mixture are to survive and play their part in the formation of a payable, first-class sward. This usually involves a comparatively light seeding of the cover crop, and often the grazing of it before it is quite ready, to save the pasture from its strong smothering effect.

With autumn-sown permanent pasture in districts characterised by long and rigorous winters, there is some justification for sowing, for example, a bushel of oats or similar crop with the grass mixture as a means of reducing the frost-lift damage which otherwise would seriously affect the young grass, but with spring sowing this is seldom justified. It is true, of course, that spring sowing to permanent pasture is frequently carried out over an extensive area of central North Island in conjunction with the regular swede crop, but, as in the South Island with rape and cereals, this is more a matter of financial expediency than sound practice. Pastures so established usually take several years to develop fully into a first-class sole (sometimes they never do), but to offset this in some degree, particularly where virgin land is in the process of being broken in, need for immediate further treatment of the land following the feeding off of the swede crop is eliminated, and a certain amount of pasturage is available to stock at an earlier date than it otherwise would be. Temporary and short-rotation pastures are also frequently established in this way, but in their cases the importance of a good, dense sward is not so vital owing to their relatively short life.

No matter whether spring or autumn sowing is contemplated, if permanent pasture is the main objective, it should receive primary consideration. If, on the other hand, the cover crop—cereal, rape, roots, etc.—is the first consideration, then the grass sown with it must be treated as of secondary importance. With care, a reasonable balance between the interests of grass and cover crop can be obtained, and there is then no reason why both should not be satisfactory.

Preparing Seed-bed

To obtain a satisfactory establishment of spring-sown pasture, whether of a permanent or semi-permanent nature, the seed-bed must be thoroughly prepared. Adequate cultivation is essential in the preparation of the seed-bed.

The time to commence ploughing for a spring sowing to pasture will naturally depend very much on local conditions of soil and climate. Because of this it must be left to the discretion of the farmer to decide for himself which is the best time, but sufficient time should be allowed for a reasonable "sweetening" period.

Rolling the furrow in the direction of ploughing is always desirable on light, well-drained land to bring the furrow slices into solid contact with the subsoil, thus facilitating adequate consolidation and movement of soil moisture. On the heavier soil types it may be necessary to permit the ploughed land to dry out to some extent before giving it further attention, but local knowledge and experience must dictate the actual practice to be adopted. Where worn-out pasture is being broken up and put straight back into grass it is often advantageous to disc thoroughly the old turf before ploughing. This hastens its decomposition, aids consolidation and moisture retention, and makes valuable plant-food more readily available to the new crop.

Final cultivation will take whatever form is necessary to bring about a seed-bed having the qualities already mentioned. Usually a double cut with the discs together with a stroke or two of the chain harrows will suffice on light land, but on heavier country considerably more working may be necessary. Where annual weeds are known to be bad it would be advisable to harrow several times at intervals of a duration sufficient to permit the germination and destruction of as many weed seeds as possible. Weeds that may then germinate with the grass are either eaten by stock or dealt with later by mowing. Rolling of the harrowed surface should, if all other work has been carefully done, complete the preparation of a satisfactory seed-bed.

Sowing

Sowing of the pasture mixture may be done by broadcasting through the topdresser, or by drilling through every coulter of a narrow-centred drill. In most cases it will be found that seed mixed with the fertiliser and sown through the topdresser will give the best results, especially on rolled land. Sufficient seed cover is then provided by harrowing with a light brush harrow, and a final rolling after sowing will press the seed into firm contact with the moist under-layer of soil, thus facilitating quick and even germination. In general the drilling of grass seed in some districts is not recommended owing to the amount of bare ground that is left for the inevitable encroachment of weeds, and the longer time necessary to form a dense pasture sward. Where only a very limited quantity of fertiliser is available, drilling is often more satisfactory.

Manuring

Although the manuring of spring-sown pastures will depend largely upon local soil conditions, most soils of the Dominion are naturally low in phosphoric acid and therefore require to be supplied with phosphatic fertilisers to make good any deficiency. Whatever form of phosphatic fertiliser is used—superphosphate, serpentine superphosphate, or reverted superphosphate, etc.—its main purpose will be to assist in the satisfactory establishment of a first-class sole of grass, and to this end it requires to be sown with the seed at a rate (when supplies are normal) that will ensure the young seedlings' obtaining all the plant food necessary

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for optimum growth. Dominion experience in this respect suggests the general use of 3cwt. per acre at time of seeding with no more for 12 months. For certain localities, such as the pumice belt of the North Island, it is recommended that 3cwt. be applied at sowing down, and a further 3cwt. after six months, that is, 6cwt. during the first year of a young pasture's life. Subsequent topdressing can usually be given at the rate of 3cwt. per acre annually.

Lime, where local experience has demonstrated its need, should be applied in suitable quantity in addition to phosphate manures, and likewise with potash. No general guidance, however, can be given in an article such as this regarding the use of these substances, but information is available at any office of the Department of Agriculture, and advice is readily given.

Seed Mixtures

Seed mixtures, like manurial practices, vary somewhat within narrow limits according to soil and climatic conditions, and the general purpose of the pasture, that is, whether chiefly for dairying or sheep grazing, etc. For a permanent pasture on well-cultivated land of average to high fertility the following mixture is suitable:—

	lb. per acre
Certified perennial ryegrass	25
Certified cocksfoot	10
Certified White Clover	2
Certified Montgomery red clover	2
Certified broad red clover	1
Total	40lb.

Slight variations may be made to this mixture to suit specific conditions or localities. Thus, in the warmer parts of the North Island, where paspalum grows well and is desired, the mixture could be amended to contain 5lb. of paspalum and 5lb. of cocksfoot, or all of the cocksfoot could be replaced by, say, 8lb. of paspalum. Again, on the lighter soil types of lower fertility, perennial ryegrass could be reduced to 15lb., cocksfoot increased to 15lb., and 4lb. crested dogstail added to the mixture. For conditions of good and well-distributed rainfall and the highest soil fertility, it is often an advantage to employ a simple mixture of 40lb. of perennial ryegrass and 2lb. of white clover, because these two species are bound to become dominant, and eventually crowd out all others. Some consideration might be given to timothy by including a pound or two in the basic mixture suggested. Italian ryegrass may possibly have claims for attention in certain districts, and where this is so it is usual to include about 5lb. per acre. It should be remembered, however, that this species has only a short life of about a year and, being a vigorous grower as well, it is not advisable to sow it too heavily in a permanent pasture, because it may later leave the sward weak and bare. Italian ryegrass is often useful in a late autumn sowing in cold districts which are liable to experience severe frosts, and in spring-sown mixtures on light sandy soil subject to wind erosion.

The short-rotation pasture differs from the permanent pasture in that it is normally required for only two or three years. Greater attention is therefore paid to the shorter-lived species, and the permanent ones requiring some years in which to develop fully—such as cocksfoot—are totally ignored. Fast-maturing permanent grasses and clovers are, however, included as shown by the following typical mixture:—

	lb. per acre
Italian ryegrass	15
Perennial ryegrass	15
White clover	2
Red clover (broad-leaf)	4
Total	36lb.

Should a short-rotation pasture be required for a longer period than 3 years, perhaps up to 5 years, it would be permissible to reduce the quantity of Italian ryegrass and include 4lb. of cocksfoot and perhaps 1lb. of timothy. For this type of pasture a special "short-rotation ryegrass" has been developed, and farmers who wish to try out this strain could replace the Italian or perennial ryegrass in the above mixture.

Temporary pastures which are intended to be used for a year or two are sown with a simple mixture containing:—

	Per acre.
Italian ryegrass	25 to 30lb.
Red clover (broad-leaf)	5 to 8lb.

This type of pasture is not subject to much variation in the components forming it, but the rate at which they are used is varied somewhat according to circumstances. The lesser amounts indicated should be sown under conditions of high soil fertility where the natural vigour of these species is given scope for promoting their full development, while under less ideal conditions which tend to inhibit growth the greater quantities should be sown.

The more important points of spring sowing of pastures can be summarised as follows:—

1. **Sow as early as general circumstances will permit.**
2. **Always sow on thoroughly-prepared land.**
3. **Sow pasture species that are known to do well in the district, and choose them and the rate of each with the view to maximum production during the life of the pasture.**
4. **Sow good strains of seed of high germination and purity. Government Certified seed will give best results.**
5. **Apply at time of seeding as much fertiliser as practicable to ensure satisfactory early growth of young seedlings. This will also help in suppressing weed growth.**
6. **Do not over-graze a young pasture, especially a spring-sown one.**

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NITROGEN is one of the key factors in successful citrus production, but it is apt to be in short supply during early spring when the trees require it most. Although cover crops eventually add nitrogen to the soil, it may be temporarily unavailable during the early decomposing processes following the ploughing under of the crop, and thus a quick-acting nitrogenous manure must be added in spring.

THIS may be sulphate of ammonia applied a month before growth commences, or nitrate of soda applied as growth starts. A slower-acting nitrogenous manure combined with phosphorus can be applied in the form of blood and bone, which is extensively used in citrus districts in New Zealand with good results. Potash is best applied in the form of sulphate of potash.

It is advisable to apply all the quick-acting nitrogenous fertiliser and potash and about two-thirds of the blood and bone manure at the end of July or during early August before the first and deepest cultivation of the year. The remaining portion of the blood and bone manure is applied during February.

Because of the variations in soil requirements in different districts and the size and vigour of trees, the quantity of manure necessary varies. Generally, the following quantities should be applied annually per mature tree:—

Sulphate of ammonia ..	2 to 4lb.
Blood and bone ..	24 to 36lb.
Sulphate of potash	1½ to 2lb.

Where cover crops are grown, the seed should be sown with superphosphate at the rate of 4cwt. per acre.

Carbonate of lime should be broadcast in most citrus orchards at the rate of 1 ton per acre each alternate year. An extra 1½lb. of lime for every 1lb. of sulphate of ammonia used should be applied and worked into the soil at least one month before the fertiliser application. This is necessary to counteract soil acidity created by the fertiliser.

Spreading Fertiliser

In mature orchards fertiliser should be spread over the entire area, but it can be concentrated near and under the spread of the trees, thus providing a heavier dressing where the tree roots are more numerous.

Maximum results from manurial applications can be secured only by working the materials into the soil in a satisfactory manner. Scientific evidence indicates that the downward movement of most plant nutrients is extremely slow when fertiliser applications are not incorporated with the soil to the desired depth.

The first cultivation of citrus orchards each spring, which in many cases embraces the turning in of a cover crop, should be made early in August and the main application of fertilisers should be worked into the soil at the same time. The cultivation unavoidably destroys many of the surface roots of the trees, but the early completion of this work enables the fibrous roots to be renewed to some extent before the critical blossoming period. It also permits the decomposing cover crop to complete its period of rapid fermentation and consequent temporary ill effect on soil conditions before the fruit-setting period commences. If these two important factors are neglected by delaying the initial cultivation of the season, the prospects of securing a heavy crop are seriously jeopardised.

Hand Digging

Hand digging around trees early in the spring not only places the manure at the desired depth, but tends to keep the fibrous roots from forming a mat near the soil surface. Such surface rooting accentuates the ill effects of relatively dry periods on the trees and crops. The depth of digging for mature trees should be about 3in. near the trunk and gradually deepened to 5in. at the drip circle of the trees. In the machine-cultivated portion of the orchard manures can be satisfactorily worked into the soil by any of the cultivating implements in general use.

Some orchardists apply all manure in the machine-cultivated parts and cultivate under the trees with a flat hoe. While this practice may reduce labour costs somewhat, tree condition is more improved by digging in a portion of the manure where there is the greatest concentration of fibrous roots.

—P. EVERETT, *Orchard Instructor, Kaikohe.*

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MAIZE

By E. H. ARNOLD, *Instructor in Agriculture, Whangarei.*

IN pre-war years the annual importation of maize from South Africa and the Dutch East Indies was between 40,000 and 120,000 bushels. For some years to come it is unlikely that overseas supplies will be available. With suitable climatic and soil conditions for successful maize growing existing in the Bay of Plenty, Gisborne, Hawke's Bay, and North Auckland districts, the Dominion can in the future, whether necessity demands or not, be self-providing in this commodity.

THE maize acreage aimed at for the coming season is 12,000 acres. This area will be substantially larger than the area planted in 1945-46, but it is highly desirable to ensure sufficient grain for feeding pigs and poultry. Every extra acre of maize grown also makes available other grains, such as wheat and barley, for more essential purposes.

Whether large areas are grown for sale, or small areas are sown to supply feed for pigs and poultry on the producing farm, maize is an easily- and cheaply-grown crop. In the more suitable maize-growing districts many farms are already adequately equipped to grow large areas. On these farms it should not be difficult to increase the area planted. Other farms lack some of the necessary equipment, but this handicap can be overcome by the co-operative use of ploughs, planters, and other machinery. On farms where only an acre or so is being grown for home farm use very little equipment is needed and much can be improvised. The initial cultivation can be carried out by contract or in co-operation with a neighbouring farmer. In some districts several farmers combine to grow their maize on one large area.

Plans for the maize crop should by now have been prepared. On some farms areas for maize have received pre-winter ploughing, but on others where pre-winter ploughing is not essential it is not too late to decide what areas are to be grown and the work can be carried out as conditions permit.

Suitable Growing Areas

As maize is a gross feeder, a deep, friable loam, well supplied with organic matter, is ideal. Good crops can be obtained on the rich river flats of Northland. Less fertile and lighter soils yield profitable but lighter crops. On the flats maize may be the initial or bringing-in crop, or be taken after grass, followed by a second crop, and the area then sown to pasture. Generally, excessive weed growth makes a third crop a doubtful proposition. On the lighter soils one crop after grass is all that is usually worth while. Maize is grown on the East Coast both on the rich, flat, alluvial soils, and the lighter hill and terrace land. On the flats maize often follows grass, but where other crops, such as swedes or pumpkins, are grown, these follow pasture, as the land is then more free of summer weeds. Up to three crops of maize are taken for grain, after which the land is resown to grass. Maize always follows grass on the lighter hill and terrace land, and usually one or perhaps two crops are grown before the area is resown to pasture.

Land of high natural fertility grows the best maize crops. An old night paddock is well suited to the crop. For pig feeding on the home farm, a small area—1 to 2 acres on a 60-cow farm—is sufficient. Old pig-runs and the ground around the milking shed, where the droppings have been dumped for many seasons, are ideal for maize growing.

Cultivation

If the preparatory cultivation is not thoroughly carried out, good seed, good land, and the liberal use of fertilisers are largely wasted. No amount of cultivation after the crop is sown can compensate for a poorly-prepared seed-bed. Maize requires a deep, well-worked seed-bed, which is firm below to distribute the roots. Cultivation requires to be done in season. It does not pay to delay and then rush the work. Two ploughings are better than one, but where only one ploughing has been done early in the spring to allow the maximum of time before sowing, good crops have resulted. One ploughing only is usually all that is necessary when maize follows maize. Where the land has been ploughed in the autumn or early winter, the soil, under the action of winter rains and frosts, will have mellowed down. On the heavy river flats, especially in North Auckland, if the soil is at all wet, it is best to delay the spring ploughing. When the ground has dried it should be ploughed as soon as possible before it becomes too dry to work. The soil will then crumble down freely, enabling a really good seed-bed to be obtained. Subsequent cultivation consists of discing, harrowing, and rolling to produce the

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desired seed-bed some weeks before the sowing of the seed.

Time of Sowing

Subject to seasonal climatic conditions, sowing in the East Coast areas takes place from mid-October until the end of November. On heavier soils, especially in North Auckland, late cultivation (and this can prove necessary and beneficial) may delay sowing until the first 10 days of December. Provided cultivation is thorough, this is no handicap.

On large areas seed is sown with a single- or double-row maize planter, or an ordinary grain drill, in rows 30 to 36in. apart, with the seed 10 to 18in. apart in the rows. Where the soils are poorer and drier it is better to plant on the "square" or "check" system, with groups of plants 3ft. apart each way. This method allows intercultivation both ways and is beneficial where weeds are troublesome. Small areas may be hand sown and the plough, discs, or three-runnered sledge used to draw the drills, the seed being covered by a light harrowing.

Between 12 and 16lb. of seed are required per acre. The actual amount used depends on the spacings of the crop and the size of the seed.

Fertilisers

A mixture of equal parts of superphosphate and blood and bone, or two parts of the former and one part of the latter, is suitable and should be used to the extent rationing permits, particularly on the lighter and poorer country, and with second or third crops.

Choice of Varieties

Where frosts are likely to occur in the spring or autumn, or where cultivation is delayed through wetness of soils, rapidly-maturing varieties are required. Slower-maturing varieties find favour in districts where a long growing season can be assured. Thus in the Gisborne area the main varieties sown are: Gisborne Horsetooth, Pfister Hybrid, Marigold, Silver Queen, Leamington's Cross, and Early Butler. In the Bay of Plenty, Opotiki growers favour Horsetooth and Early Butler, while in the Tauranga area Large Yellow Dent is mostly grown. In Northland, Johannson's White, and, if pure strains are available, Prairie Queen and 90 Day are suitable. Pfister Hybrid is a comparatively new introduction and is proving popular as a high-producing line. As much of the seed maize available is badly crossed, the new grower is well advised to obtain supplies from a reputable commercial grower in his own district.

Sowing with a double-row planter.

Intercultivation

Intercultivation, by maintaining a soil mulch and destroying weeds, results in more moisture for the crop. One successful maize grower contends that every intercultivation results in at least 5 extra bushels of grain per acre. A light harrowing, even when the plants reach 6in. in height, destroys incipient weed growth. The harrows should be kept free from clogging rubbish and used on a bright day when the plants are tough and supple. For as long as it is possible for the inter-row cultivator to pass along the rows, a scarifying should be given every 10 days. During the early stages of growth these cultivations can be 4 or 5in. deep, but the depth must be reduced later to 2 or 3in. and kept away from the plants themselves, or a large number of valuable feeding roots will be destroyed. On small areas, especially where the harrows have not been used, a hand hoeing when the plants are 10in. high is useful.

Use as Greenfeed

In districts where greenfeed is required to keep up the milk supply a certain amount of maize is grown for cutting and feeding green to the cows. In a wet season the growth may be used for making silage. The varieties usually sown for this purpose are Hickory King and Horsetooth. If broadcast, 2 to 2½ bushels per acre are required, and if sown through every coulter or second coulter of the grain drill, up to 2 bushels per acre are used.

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THE BEE SMOKER

By C. R. PATERSON, *Apiary Instructor, Hamilton.*

IN apiary work a bee smoker is essential to quieten the bees and keep them under control while carrying out hive manipulations. This simple but very necessary piece of apiary equipment is usually the most neglected. Reasonable care in keeping the smoker clean and functioning properly prevents many stings. A hive should never be opened up until the beekeeper is sure the smoker is working properly.

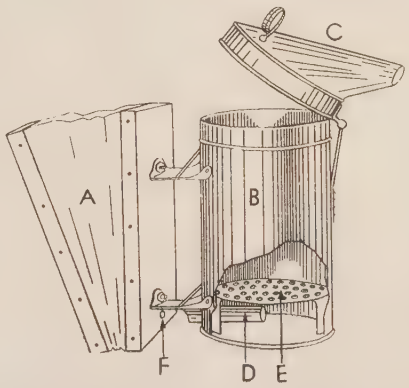
THE modern smoker is an improvement on those used in the early days of beekeeping. It is constructed to give a good volume of smoke without the risk of blowing or dropping sparks into the hive. This is done by means of the deflected nozzle shown as (C) in the accompanying illustration. The nozzle allows the smoke to be blown gently on the bees without tipping the smoker.

The bellows (A) force the blast of air into the combustion chamber of the smoker, which is not directly connected to the barrel of the smoker, because it is necessary always to have an opening into the smoker barrel to keep the fuel alight when the smoker is idle for a short time. Should the opening (F) in the bellows become partially blocked (a frequent occurrence), the blast of air may be deflected and not blow direct into the open tube (D).

Anti-spark Tube

The anti-spark tube (D) is a special feature of the modern smoker. The end of the tube reaches the centre of the grate (E) and prevents sparks from working backwards on to the clothing of the operator. This tube also carries the blast of air from the hole in the bellows. After continual use, soot and dust accumulate around the tube and unless these are cleaned away frequently, the blockage retards the efficiency of the smoker. The grid (E) is to keep the fuel away from the blast tube. All holes in this grid should be kept clean and open at all times.

After the smoker has been in use for some time, beekeepers will find that it begins to give off an offensive



smell, which appears to irritate the bees considerably. This is caused by a black tar-like deposit which forms on the inside of the barrel and which is sufficient in many cases to gum up the smoker completely. This deposit should be thoroughly cleaned away at regular intervals, and at the same time the grid should be removed and any accumulation round the blast or anti-spark tube cleaned away. It is only by constant attention to these details that the smoker will function efficiently and serve the purpose for which it was constructed.

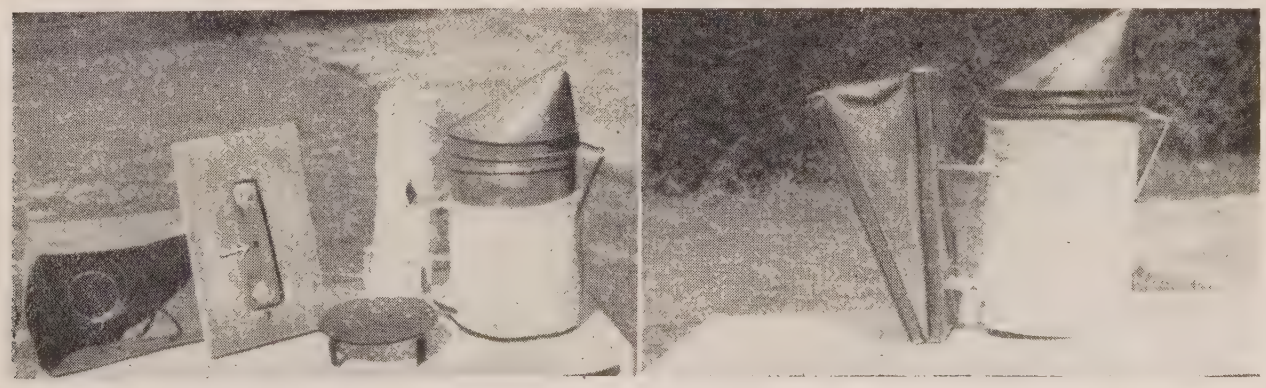
Fuel

The most popular fuel is good clean sacking that has been placed out in the weather for a short period. A suitable sack may be tightly rolled up lengthwise, and pieces the desired length chopped off with a sharp axe. A supply of these cut lengths can be kept handy in a box for use during the busy season, thus avoiding the inconvenience of having to hunt round for suitable fuel at short notice.

Holding Smoker

A hook attached to the bellows is sometimes used to hold the smoker on the edge of the hive, so that at all times it is readily available to control the bees. Many beekeepers prefer to hold the smoker between the knees, because in this position it can be brought into action very quickly. Unfortunately, the barrel of the smoker becomes very hot after a little use, and anyone adopting this holding method may have the legs of their trousers badly scorched. To overcome this trouble wrap a layer of asbestos cord round the copper barrel of the smoker. This gives arms or clothing adequate protection against burns. About ¼lb. asbestos cord is sufficient for a large smoker. This should be wound round the barrel tightly and evenly, starting and finishing as one would bind a cricket bat with string. A coat of enamel paint puts a good skin on the asbestos and allows it to be wiped clean if the smoker becomes sticky when in use.

Considerable difficulty is often caused by the bolts that hold the barrel to the bellows. When the nuts are being tightened these bolts instead of remaining firm may turn round. Sometimes the nuts come off the bolts and the bolts disappear into the bellows. When this happens and the leather has to be removed, a recurrence of the trouble may be prevented by soldering the head of each bolt on to a heavy strip of galvanised iron or brass. The strip is held in place by a wooden screw, indicated by an arrow in the illustration. Once this is done the bolts cannot push back out of place or turn round when the nuts are tightened up.



Left—Method of securing bolts and wrapping asbestos round smoker. Right—Reassembled smoker ready for use.

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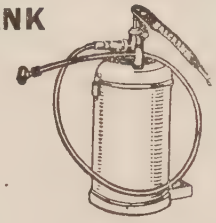

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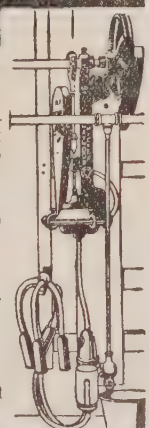

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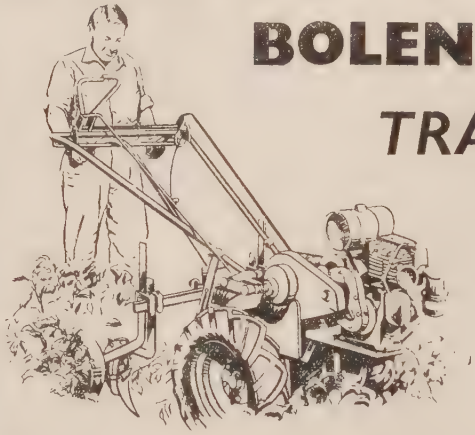

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PAMPAS GRASS

By E. B. GLANVILLE, *Instructor in Agriculture, Auckland.*

FARMERS who intend planting pampas grass during the coming spring will no doubt have chosen the site now and given thought to the preparation of the area to be planted. If plant requirements have not already been ordered, this should be attended to at once, as planting time is approaching. In districts which enjoy a mild climate planting can begin this month, but there is little to be gained by undue hurry.

LIKE all forage crops, pampas establishes better if the area has been ploughed and thoroughly cultivated before the plants are set out.

Site and Soil

As inter-row cultivation should be given for at least the first year to prevent the transplants from being smothered by weed growth, the site chosen should not be so steep that ploughing and subsequent cultivation cannot be adequately carried out. It should have easy access and be adjacent to a number of fields which can be grazed in conjunction with the plantation. If this practice is adopted when grazing the plantation, better utilisation of pampas results, as it provides the bulk for the cattle which is so desirable with winter grazing.

Pampas will grow on a wide range of soil types, but the success of the ultimate establishment and production from the plantation will depend on the soil type and its fertility. Pampas will not establish well or thrive if planted in waste areas on the farm which are infested with weeds or where the soil is poor and of low fertility. The ideal soil on which the best pampas establishment and production results are obtained is a well-drained, rich swamp.

Winter Feed

Cattle winter quite well on pampas when it is fed with grass, and in practically all pampas plantations quite a considerable amount of grass roughage is available for the grazing animal.

The provision of a good plantation of pampas provides a great saving in labour in winter feeding on the farm. It probably provides as good, or perhaps better, food value to dairy stock than does a large quantity of poorly-made hay which is so commonly saved on many farms, but it is doubtful if it is better than well-made, good-quality meadow hay.

On the hill-country farm where the provision of winter feed to carry cattle through the period of feed shortage is a problem, pampas has a definite value, and hill-country farmers who have no pampas on their farms would be well advised, if they have a suitable site, to consider the establishment of a plantation.

Plants

Two-year-old well-rooted plants give the best and quickest establishment. Seedling plants are used in great quantities, but these are generally small and are not recommended. When plants of this type are purchased, rather than plant them immediately in their permanent positions, it is better to plant them in nursery rows in a selected, well-sheltered area for about a year before being set out in their permanent positions.

Care should be taken to select a suitable nursery site so that the plants will have every chance to make vigorous growth. They should be kept free from weeds, and regular inter-row cultivation should be carried out while the plants are in the nursery beds.

Planting Out

When transferring the plants to their permanent position rows should be spaced 7ft. 6in. apart with 7ft. 6in. between the plants. It is advisable to space outside rows at least 9ft. away from fences enclosing the plantation, to prevent stock grazing the plants in these rows through the fences of adjoining paddocks, pushing the fences into such disrepair that they will not afford the plantation suitable protection. The extra space between outside rows and fences also allows stock easy access to all parts of the plantation when grazing commences.

Preventing Flowering

It is necessary to prevent the plantation from producing mature flowers. Flower stalks generally make their appearance in late summer, and if the plantation is grazed during late February or early March, stock will eat the flower stalks first in preference to the rest of the plant. As pampas is grown for winter feed, it is only in seasons such as the one just experienced that it is likely to be required for grazing during the late summer, and consequently it is necessary to remove the flower heads to prevent them from maturing.

A good strong-rooted pampas plant.

After the plantation has been grazed it is desirable to clean up the area so that the plants will commence clean, fresh spring growth, and it is the usual practice to do this by firing.

Palatability

Some authorities claim that there is a great difference in palatability in plants of different origin, but there is no definite information at present available to support this. The writer has seen many pampas grass plantations established with plants obtained from different sources, and it has not been possible to determine whether one strain is better than another in growth or palatability. Stock are very selective in their choice of grazing plants and if there is any difference in the palatability of plants, stock would no doubt indicate their preference very clearly.

Investigational work is at present being conducted by the Fields Division of the Department of Agriculture to endeavour to obtain information on strain and palatability. Plantations were established last spring with plants from various sources, and a close study is being made of the growth of plants. Later, when the plantations are ready for grazing, palatability will be studied, but it will be a few years before any definite conclusions are obtained.

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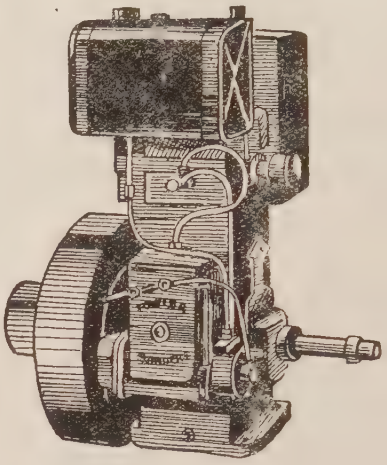

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New Approach to Weed Control

HORMONE WEEDKILLERS

By R. K. WARD, *Soil Fertility Research Station, Hamilton.*

MUCH interest has been roused in farming circles by overseas reports of the discovery of a new type of weedkiller. These weedkillers or herbicides are variously described as "hormone," "growth controlling," or "growth regulating" substances, and the invention of a host of new names for proprietary preparations of this type is already well under way. Such names as 2-4D, T.C.P., D.C.P., C.L.C., C.C.C., Agroxone, Weedone, and Methoxone are becoming familiar to farmers of Britain, Canada, and the United States and to many of our own farming community having access to overseas journals.

IT has long been known that a small number of fairly complex chemical compounds produce abnormal growth effects when suitably applied to plant tissue. These substances have come to be known collectively as "plant hormones" or plant growth substances. They have been put to practical use in stimulating root development in cuttings of nursery plants which are otherwise difficult to propagate. They have also had some practical application in the control of pre-harvest drop of fruit crops and for increasing the setting of fruit blossom, especially in tomatoes. It was not long before it was discovered that excessive applications of these substances produced damage. During the past 10 years a search for alternative substances more potent and more easily manufactured has revealed that plants respond in similar fashion to quite a large number of compounds.

From among these active substances a small number with the strongest degree of activity have been selected for study as weedkillers. Unfortunately, perhaps, the technical names of these substances appear too difficult of pronunciation for every-day use, hence the more facile names such as T.C.P. and C.C.C. At present considerable research is proceeding in the use of dichloro-phenoxy acetic acid, trichloro-phenoxy acetic acid, methylchloro-phenoxy acetic acid, and their salts of sodium and ammonia. It is believed that limited quantities of various preparations are on sale overseas but that production is not yet fully under way. This may not be undesirable, since much has yet to be learned about the conditions of their use, the weeds susceptible to them, and their effects on desirable plant species and on the soil.

Results of Experiments

Only with considerable trouble has the Department of Agriculture obtained even the smallest quantities of a number of hormone preparations for experiments. At the newly-established Soil Fertility Research Station at Hamilton some of these preparations are now undergoing trials in which they have been applied to ragwort, blackberry, and other weeds of pastures. Preliminary tests with ragwort and several other weeds of the daisy family are promising. Clovers appear to be quite susceptible, but the related gorse plant appears to be more resistant. Blackberry is also resistant to a considerable degree in conditions of restricted growth caused by a prolonged dry spell. Generally most grasses are resistant and there appears to be little hope of help from this quarter in the control of weeds of the grass family.

Ragwort. Left—A few days after treatment. Right—The final result of treatment with 2-4D. Note the twisted stems with the thickened areas. Splitting is also evident.

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Left—Untreated gorse. Right—Three weeks after treatment with 2-4D, showing little effect beyond the bending of the tips.

Most of these hormone substances in the pure state are finely crystalline, white or cream coloured, have a penetrating smell, and are not very soluble in water. It is probable that they will come on to the market in the form of mixtures containing other substances which will facilitate solution of the active principle in water. Dry preparations might contain added sodium bicarbonate, and wet preparations might be solutions or suspensions of the active principle in a wetting and spreading agent. It is probable that preparations suitable for dusting application will also be on the market.

The visible affects from the application of these weedkillers to plants are slow to appear to the casual eye, and two months or more may elapse before a treated plant appears to be completely dead. There is not the spectacular leaf scorch that rapidly follows the use of chlorate and other contact weedkillers. The first reaction, which may appear in a few hours, is the inward curling of the edges of the leaves and the rigidly erect position adopted by the entire leaf on its stalk. Somewhat later flower stalks bend over at about two to four inches from the tip. This is a rigid attitude not caused by flaccidity of the tissues of the stem. If the application has been inadequate to cause death, the flower stalk will later bend upward again at a higher point, with the result that the stalk has a distinct S-bend half way up its length. In blackberry the tips of the horizontal runners and leaf stalks, and in bracken the young fronds, become extremely distorted by corkscrew-like contortions. The flowering of ragwort is depressed if the weedicide is applied early and strong enough, but otherwise may proceed more or less normally.

In the mature ragwort plant treatment results in the characteristic bending of the flower stalks. Later splitting occurs toward the base of the stalk with the formation of small callus areas. From these areas growths arise which suggest the development of aerial roots. This condition is usually followed by the death of the plant. Though yellowing of the leaves begins within a few days of treatment, complete defoliation may not take place for six weeks or longer.

Growth Activities Upset

Just how lethal doses of these weedicides act on the plant is not known. It would appear that minute quantities gain entrance as fumes through the "breathing pores" of the plant, or directly through the leaf surface. Symptoms which have been observed in the root system of foliage-treated plants indicate that the substance, or some lethal factor developed by it, penetrates throughout the plant, probably carried by the sap stream. Normal plant growth activity is governed by a number of distinct enzymes or "ferments," which are in turn activated by a normal complement of hormones, each having its own particular role to play. It appears probable that the hormonal weedicide is able to interfere in the operation of one or more of the normal growth activities, upsetting the complex organisation within the plant. When this disorganisation is sufficiently severe, death results.

In animals, where hormone activity is better understood than in plants, several types of hormonal disturbance are familiar. In some there is a lack of secretion, in others an oversecretion by some ductless gland resulting in illness or death. The hope is justified that future research will throw much further light on the subject of plant hormones.

It is the intention of the Department to continue these trials on a more extensive scale in the coming season. Reports on the results will be published with the intention of keeping farmers informed of advances in knowledge of hormone and other new weedicides.

In the meantime careful thought should temper the enthusiasm roused by glowing accounts in popular "scientific" journals. Varying conditions of soil and climate make the selective killing of a weed plant surrounded by desirable species a problem of great complexity. The probable cost of material, equipment, and labour required for application also should be a sobering consideration.

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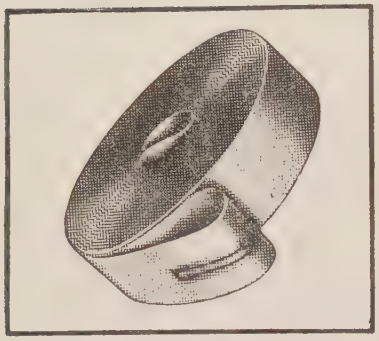

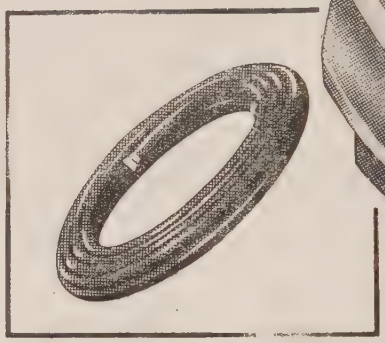

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GOODYEAR

RUBBER PRODUCTS FOR THE FARM

CULTIVATION AND GRAFTING

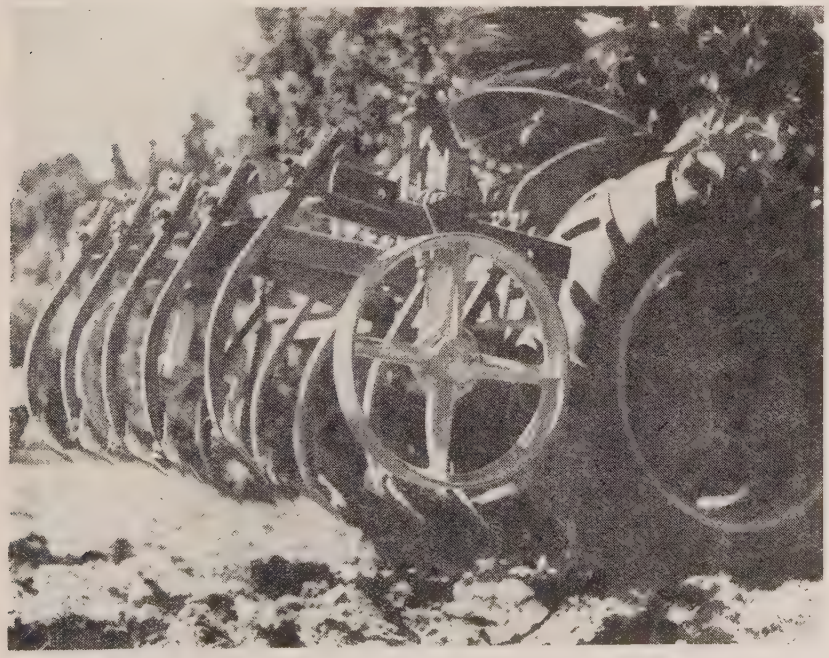
By A. R. GRAINGER, *Orchard Instructor, Christchurch.*

CULTIVATION of the soil in orchards in the spring and early summer is sound practice under New Zealand conditions; only in exceptional circumstances should this work be omitted. Occasions on which it may be found an advantage to refrain from cultivation are:—

1. When trees are exceptionally vigorous, and are therefore slow in coming into bearing, the omitting of cultivation may tend to check wood growth and encourage fruit spur development.
2. When erosion threatens serious damage to hillside orchards, the temporary sowing down in grass of, say, alternate lands may be justified.

New Zealand experience definitely points to the advantages of cultivation in the early part of the growing season to promote growth of orchard trees. Though the rotary hoe may be better suited to orchard cultivation than to general farming, the tractor, plough, disc and harrow combination is recommended for orchard work as it has a wider range of useful application. Some growers dispense with the plough and rely on discs to break up the land. This practice has its limitations, and the plough is still useful for quick, clean disposal of heavy cover crops (after an initial discing) or the opening up of drainage furrows and similar work.

An orchard cultivator at work close to trees.



An orchard cultivator raised clear of the ground by a power lift attachment.

Choice of Machinery

Now that supplies are becoming readily available, many fruit growers are considering the purchase of new cultivating machinery. Initial cost may determine the type purchased in some instances, but the main consideration should be the suitability of the implements for the greater portion of the work to be carried out.

Of the types of tractors available, it is possible, within limits, to make general recommendations for their use by orchardists:—

Two horsepower: Suitable only as an inter-row market garden or small fruit cultivator.

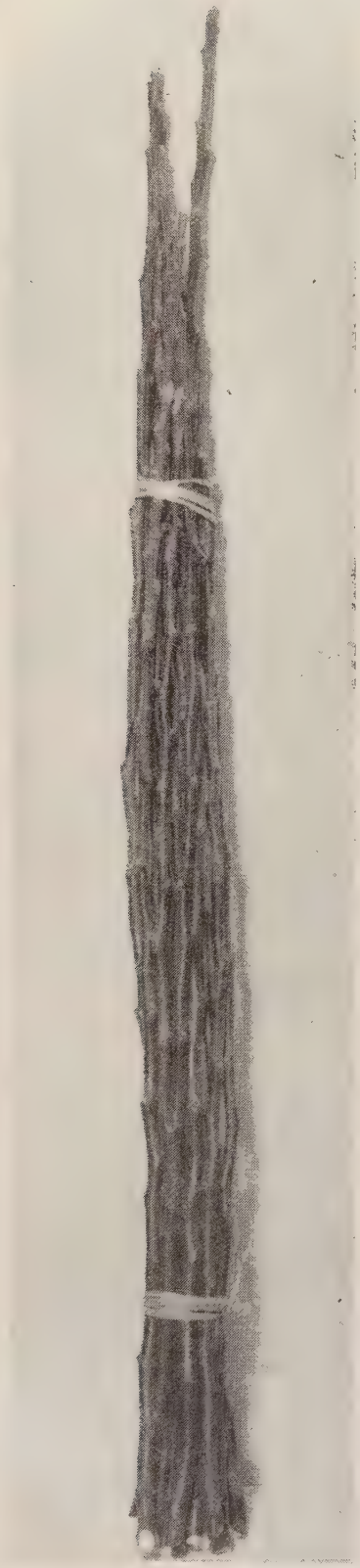
Five horsepower: Suitable for two or three acres of orchard, but generally only on easily-worked land.

Ten to 15 horsepower: One of the most suitable for the average orchard of 5 to 10 acres. It will pull two light furrows or one heavy type, and tandem discs and cultivators.

Sixteen to 25 horsepower: Suitable for large orchards of 12 acres and more.

Discs and Grubbers

One of the most suitable types of discs for orchards is known as the



[*Green and Hahn photo.*

Good types of grafting wood.

tandem offset tractor disc harrows. They cut the soil and thrust it in one direction with the front set of blades and throw it back again with the rear set, leaving a level surface. Being offset, they can be worked close to the trees.

There are two types of grubber, the spring-tooth and the rigid. The spring-tooth is suitable for light harrowing and dragging out couch grass, and the rigid type is useful for breaking up the heavier soils and for working more deeply.

Tractor Equipment

Some makes of tractor are now supplied with a power lift by means of which cultivating implements can be lifted clear of the ground by pressing a lever from the driver's seat. This is a great time-saver in the orchard and enables the operator to cultivate corners and headlands where it would be difficult to work without this advantage. The steering on some makes can be adjusted so that it is possible to circle a single tree trunk closely.

It is often desirable to make quick changes from one implement to another, or to set one closer to or further away from the trees, so the type of drawbar and the method of attaching implements to it are important to the orchardist.

Where a furrow has been opened in the centre of the lands to assist drainage during the winter, the initial spring cultivation consists of ploughing in to the centre and away from the trees, approaching the tree trunks as near as practicable to reduce hand digging. The soil should be disced back into place as soon as possible to avoid possible exposure of roots.

Photographs by Green and Hahn.

Preparations for Grafting

The time for grafting, from the green tip to the pink stage, is somewhat restricted, and a decision as to whether grafting is to be carried out during the coming season should be made now, as preparations must begin at once. The following must be determined:—

1. The new variety to be grown.
2. The approximate number of trees to be reworked.
3. The method of grafting to be employed.
4. The type of sealing material to be used.
5. The type of grafting to be employed (whip, bark), as tying material varies with this.

Points 2 and 3 determine the quantity of grafting wood to be obtained.

Unless some care is exercised in the selection of grafting wood, future results may be disappointing. The points to be observed are:—

1. Select one-year-old wood about the thickness of a lead pencil ($\frac{5}{16}$in. to $\frac{3}{8}$in.).
2. Obtain wood from trees known to produce good crops of the best type of fruit.
3. See that parent trees are free from disease, particularly crinkle, confluent bitter pit, or powdery mildew.
4. If grafting wood of more than one variety is being procured, care should be taken to see that the identity of each lot is maintained.

Grafting wood must be kept dormant until it is used. Place it in a fully-shaded position in light sandy soil which remains moist but not wet. The cut ends should be in the ground and the tips left uncut to keep the wood from drying out.

HARVESTING APPLES AND PEARS

As considerable quantities of the apples and pears produced in New Zealand each year are required for long-term cool storage, careful harvesting and packing in preparing the fruit for market is essential. Bulletin No. 253, "Harvesting and Packing the Apple and Pear Crop for the Home Market," will be found a valuable guide to the industry in the handling of these fruits from orchard to market. This bulletin is available free from offices of the Department of Agriculture at Auckland, Wellington, Christchurch, and Dunedin.

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CROPPING FOR PIGS

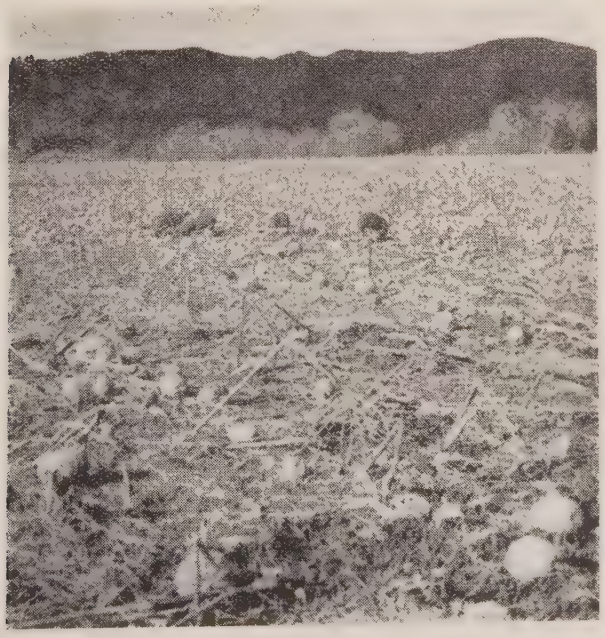
By E. H. ARNOLD, *Instructor in Agriculture, Whangarei.*

A FEATURE of high pig production is the growing of a small area of crops for supplementary feed, and home-grown crops for wintering are the means of increasing production of pig meats. The cropping programme should provide for economical wintering of sufficient pigs, both breeding and store stock, to cope with the flush of dairy by-products effectively. It should also aim to even up the feed supply at any period when the skim-milk drops suddenly, so that the pigs can be finished off rather than sold on an over-supplied market.

A REVIEW of the cropping for pigs, in particular over the past two seasons, reveals that, while many a crop was grown on a soil type unsuited for it, insufficient attention to other important factors resulted in poor yields. From the individual farmer's viewpoint, as well as from the necessity of producing the maximum of pig meat, the best results must be obtained in return for the labour and money expended.

The Area Required

Many farmers attempted to grow areas larger than could be handled efficiently and giving returns in excess of the requirements of pigs on their farms. When it is remembered that a store pig, wintered in a thriving condition over 3 months, will consume approximately ½ ton of roots or 2½ bushels of maize, and that breeding stock will consume two to three times these quantities, the 10 pigs per acre allowed under the Pig Crop Subsidy Scheme is a liberal basis. In practice, when average yields are obtained ¾ to 1 acre of roots or pumpkins, or 1 to 1½ acres of maize, along with the necessary small amounts of meat-meal and grazing, will provide sufficient winter food for all the breeding stock on a 60-cow farm with up to 25 store pigs.



Pigs wintering on maize and kumikumis.

Well-wintered store pigs.

Cultivation Considerations

Intensive cultivation of a small area produces large yields of cheap pig food. It is more economical to obtain 60 to 70 bushels of maize from 1 acre than the same quantity from 2 acres. When time and labour are limited, as is the case on the dairy farm in the spring, and when late rains hold up the cultivation of the heavier soils, a small and limited area can receive adequate cultivation, while a larger area is usually sown down before the seed-bed is properly prepared. Thorough cultivation before sowing makes the subsequent work easier and ensures high yields. Furthermore, if the growing period is wet and weeds grow freely, they can be more thoroughly destroyed on a small area.

Soils and Fertility

Attempts have been made in the past to grow pig crops on soils from which economic yields could not reasonably be expected. Some farmers tried to overcome the small yields per acre by sowing down two, three, or even ten times the area required on more suitable soils. This plan proved unsuccessful, and in many cases no worthwhile quantities of pig food were obtained.

For moderately-fertile soils, the phosphatic fertiliser available is fairly satisfactory, but, as a small area only is involved, it is quite practicable to build up fertility by spreading and ploughing in the droppings from the milking shed and from the pig-fattening pens. There may also be small areas where fertility has accumulated over the years—an odd half acre where shed manure has been deposited, an acre or so of pig-runs, or a small calf paddock. If these areas are ploughed up, both pigs and calves will do better by grazing on clean pastures, while the farmer can take advantage of the stored-up fertility. A portion of the night paddock is another suitable area. On nearly all soils and for most crops the application of one ton of lime per acre will prove beneficial.

The Crops

The choice of crops depends on the suitability of the particular farm on which they are to be grown. A number of crops not only provides a variety of foods for pigs and permits a longer feeding period, but assists in easing the labour position. Certain crops require no work between sowing and harvesting, while others demand considerable attention in thinning and weeding.

Maize:

Maize is suited to the moist, warm climates, particularly of the East Coast and North Auckland. In the Waikato and other districts successful crops can be grown by sowing early-maturing varieties. Maize requires the minimum of storage and harvesting, and the grain is ready for feeding in May. If necessary, the later-picked, well-matured cobs can be held over for feeding in the following winter.

Barley and Peas:

While barley and peas are good pig feeds, they are not usually grown in moist climates, where the conditions cause overgrowth of stem and leaf and may make harvesting difficult. Barley involves a considerable amount of work in harvesting, while under high-rainfall conditions, peas are subject to fungoid diseases.

Pumpkins and Kumikumis:

Pumpkins and kumikumis require similar conditions to maize, with which crop they are often grown. In some districts table varieties of pumpkins yield more feed units per acre than cattle pumpkins, while kumikumis are popular because of their high yield and ability to stand drought better than pumpkins.

Dual cropping maize and pumpkins.

Mangolds and Sugar Beet:

Mangolds and sugar beet require similar soil conditions and cultural methods. In moist climates where weeds may be prolific both crops are best transplanted. Preference should be given to sugar beet. Although its yield is less than mangolds, it has greater palatability and feeding value. Sugar beet is an excellent keeping crop and is available from May to August. It can be left in the ground until required, and the leaves can also be used as feed. Mangolds give high yields per acre, but are of lower feeding value and palatability. They keep well, but require to be pulled and stored about one month before feeding.

Carrots:

Carrots do well on fertile sandy loams, and are available from April. They keep well and can be lifted from the ground as required. The feed unit yield per acre is about that of mangolds, but they are more relished by pigs.

Swedes:

Swedes, which provide a bulky diet for pigs, are difficult to grow in districts where the rainfall is low, and do best in moist, cold climates. In the Auckland Province swedes are ready for feeding in May, but they keep only moderately well, and cannot be relied on for late winter feeding.

Chou Moellier:

Chou moellier requires the same treatment as swedes, but it has to be sown a month earlier. This crop is increasing in popularity because it is much more resistant to dry rot and insect attack. It can be fed all through the winter.

Artichokes:

Artichokes, which are grown similarly to potatoes, require a rich soil, and the crop should be replanted each year. Any old corner of the farm is not necessarily suitable for artichokes. Its yield of feed units per acre is low, but it has the advantage of being able to be harvested by the pigs themselves.

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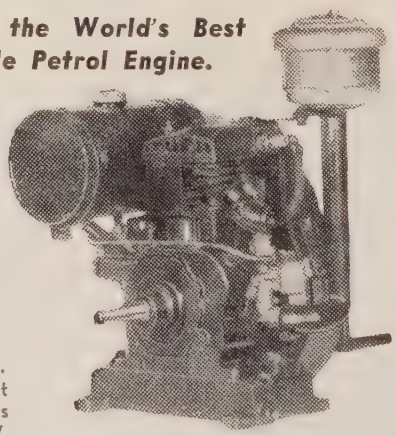

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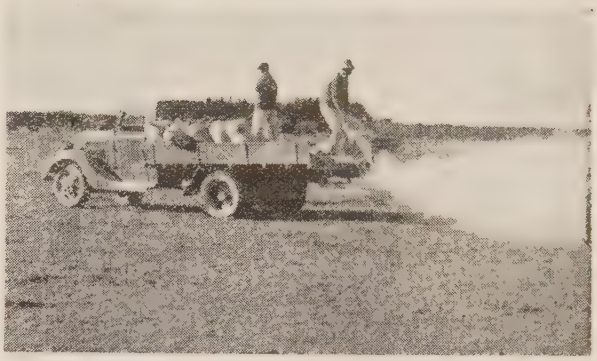
TOPDRESSING RESULTS IN MARLBOROUGH

By D. R. WILKIE, *Instructor in Agriculture, Blenheim.*

THE story of topdressing in Marlborough is a simple one of excellent responses to lime and superphosphate, with other manures almost out of the picture. Many are the instances of these facts, both from Departmental experiments—which, after all, merely point the way—and from applications on a farm scale. One significant feature is the lack of response from applications of potash.



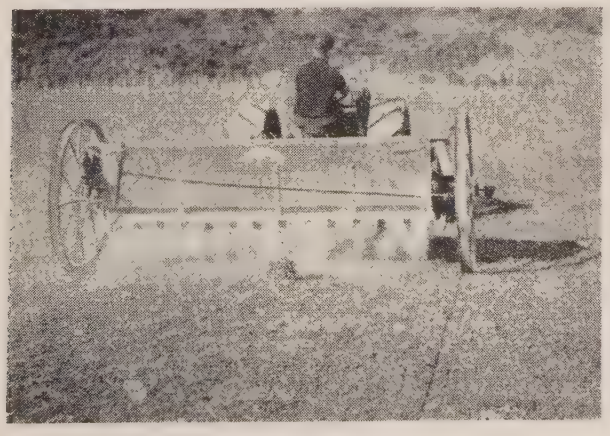
UNTIL recent years Marlborough Province was somewhat isolated from the rest of New Zealand. Because of transport difficulties topdressing, though a recognised procedure in other districts, was accepted only slowly as an aid to production in Marlborough. In part this slowness was caused by the cost of manures and the dry conditions. Dryness is normal in the summer, and had a big bearing in retarding the practice of topdressing.

Covering an area of 2,768,000 acres, Marlborough Province has ample scope for an increased use of topdressing, with both lime and manure, to improve the production of its grasslands. The total area in sown grassland in 1942-43 was 386,146 acres, and the total area topdressed with manure and lime combined was 17,948 acres—a mere 4.65 per cent.

However, before the war there was a steady increase in the use of this important production factor, despite high costs, dry conditions, and adverse local comment. It became apparent that the topdressing of pastures had much to commend it, and was profitable providing the pasture was of sufficient quality to warrant it. The practice grew till the war and stringent fertiliser rationing put a stop to further expansion. Because of the relatively small consumption in pre-war years, Marlborough grasslands have not received much fertiliser during the past five years. When the fertiliser rationing is lifted, and with the improved rail facilities now in use, topdressing in the province is expected to expand rapidly within the next few years.

Transport in Sounds County

The counties, of course, have their own problems to meet. Perhaps the most difficult proposition is in the Sounds County. This district consists of 233,280 acres.



Most of it is hilly, and a good proportion is reverting to second growth, but it includes areas which make admirable sheep country and some of the flats are capable of great development.

There are few farmers here who do not know by experience, or from trials which have been laid down by the Department, that topdressing is capable of greatly increasing their production, but the nature of the country, the cost of manures, and freight charges are such that the extensive use of fertilisers is severely handicapped. For instance, in the Pelorus Sound, an area from which good stock is drafted, manures must be railed unless they come direct by sea, a rarity in these days of shipping shortages. From the rail at Picton they are carted to a launch, taken from this launch by lorry over the hill from Queen Charlotte to Pelorus Sound, reloaded on to another launch and thence to the farmers' jetty. In most cases the manure has to be applied by hand on the hilly country, the passage of machinery not being feasible. Though responses are good, it is understandable that under these conditions topdressing in this district is making slow headway. It is difficult to imagine that there will be great improvement here until transport difficulties are overcome and manure can be landed on the farms at a reasonable price.

The position with lime is even more serious. Freight charges, exclusive of the rail subsidy, often come to more than the cost of the lime, and this without spreading charges. This applies over an extensive district, parts of which could without doubt raise production considerably with adequate topdressing.

Marlborough County

In Marlborough County, consisting mainly of the Wairau and subsidiary valleys and covering 1,228,800 acres, topdressing is on a much better footing. The railway is available, spreading machinery is at call, and most of the difficulties of the Sounds farmers are smoothed out. Further south, in Awatere County (652,260 acres) and in the Kaikoura district (604,560 acres), much the same position applies. In these three counties most of the province's fertiliser and lime is used.

But even here there is some difficulty. In most cases the areas most in need of manuring and liming are furthest from the rail. These areas lie at the heads of the valleys and fertilisers are much more costly to apply because of long hauls by lorry.

Departmental Trials

Throughout all these counties the Department of Agriculture has made topdressing trials during the past decade, using mainly lime, phosphate, potash, and nitrogenous manures. A noticeable feature is the surprising consistency of results.

TOPDRESSING IN MARLBOROUGH

These trials have shown that superphosphate coupled with adequate lime dressings gives the best results on most types of land in Marlborough. The fact that dressings of potash on grasslands have given a very poor result, even when assisted with lime, is most noticeable.

With some variations, practically identical results have been secured on the light land at the head of the Wairau Valley, in the Sounds area, in the Awatere Valley, and on the heavy land at the lower end of the Wairau Plain. At Flaxbourne and Clarence Bridge run-out pastures have shown wonderful recovery after applications of lime and superphosphate. These small trials have been followed up and verified on a farm scale, and these results corroborate the evidence of the earlier trials.

Though rationing has cut down the amount of fertiliser coming into the district, it seems that scarcity has bred appreciation. There is no doubt that today the value of topdressing is better realised in Marlborough than ever before. When conditions return to normal topdressing of pastures is expected to be one of the main avenues through which future increases of production will be secured.

Answer to Correspondent

Sheep with Staggers

"B.M.R.," Whangarei:—

I wish to inquire of you the cause and cure of the unusual behaviour of a number of wethers which were being driven to the works, five days away. The first day they were driven fourteen miles by three experienced drovers who said they went well. The second day another experienced drover and myself took them six miles, giving them about three hours' rest on a river bend with ample water. That night they were put in a danthonia paddock with water. Next morning when we went to take them out of the paddock, two were lying down helpless in the legs and blind, but very alert to the dogs. Another one was running around tripping over, and banging into things. Yet another was leaning back on its back legs, gritting its teeth, frothing at the mouth, blinking its eyes, shaking and twitching in stomach and muscles, with slightly hollow back, and chin touching chest, making the crest of neck prominent. This would last for 30-60 seconds. The neck would slowly straighten out and the shaking stop. Next it would walk about and head back in the direction it had come. By the time we got them out of the paddock about fifteen were blind. About a mile along the road we left them where they could get plenty of water. They kept on taking fits. The fits were more pronounced whenever they were moved. Some had it three or four times. If they were walking they went into the fit quite suddenly. If they were lying down they were in a stupor, but as soon as they were disturbed they took a fit. There were 1,000 sheep in the mob, 30 of which were so dopey and reluctant to move after they had had the fit, especially if more than once, that they were trucked the rest of the way. Three or four more took fits before they finally reached the works.

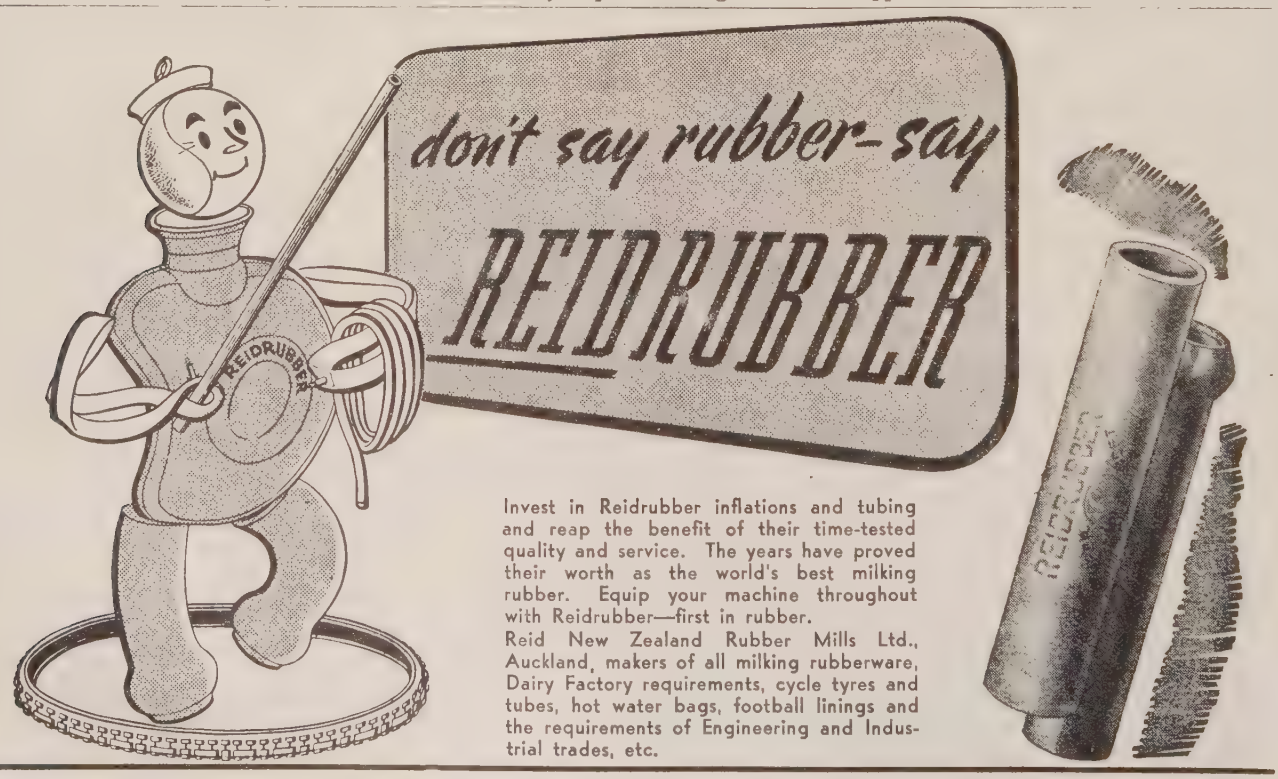
LIVESTOCK DIVISION:—

The description of the trouble with your wethers is very vivid and recalls the symptoms of so-called ryegrass staggers which are due to some upset of the central nervous system.

With ryegrass staggers it is found that exertion accentuates the trouble and it may be possible that your wethers had access to ryegrass pasture before the droving began. Ingestion of paspalum under certain conditions will produce similar symptoms.

The possibility of the sheep having eaten some herbage (especially tutu) on the river-bed has to be considered. The peculiar actions of the wethers were due to some central nervous system derangement probably brought about by the ingestion of certain plants containing a toxin.

Treatment of similar cases would be along general lines. Leave well alone with plenty of water. Do not drench or otherwise disturb the sheep until all signs of nervous spasms have disappeared.



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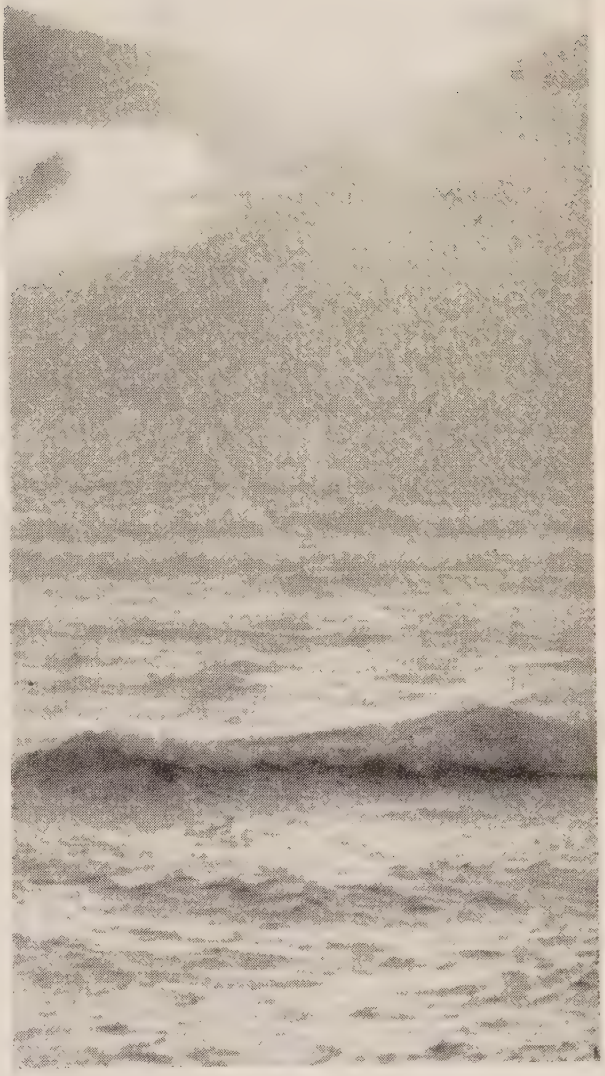
"They That Have Eyes to See . . ."



[*Sparrow Industrial Pictures photo.*

I WAS up very early this morning. The air was still and cold, yet it held a softness bequeathed by the departed autumn, and the tall pines lifted their arms to the sky in solemn benediction. Far away a mist-grey rim of sea lay pencilled against the horizon, and across the valley pearly rifts of light touched the quiet hills. Suddenly the sky was dark with wings and a flock of gulls soared inland. It was only a moment of time before they were lost to sight, but the matchless symmetry of their flight has lingered in my memory all day, lightening the tedium of routine tasks, loosening the grip of petty cares.

Though the world is full of beauty—and our own country particularly so—too many people go through life oblivious of the loveliness around them. The iris hues of a dewdrop delicately poised on a blade of grass; the frail, feathery tentacles of lichens clinging to weathered stones; the "small, unwilling sands that tremble and break"; the ivoried skeletons of fallen leaves; the silver splinters of rain—these have no meaning for them. They have never experienced the emotion of the poet who wrote of a tree on a hillside:

"Morning glorifies her mantling jade,
The sky is leaning to her laughter there,
The youngest blues have blossomed in her shade.
Is it enough to love and hymn a tree?
I know it is. So beautifully swept
The wind of mighty music from the sea
And woke her leaves. This watcher could have wept. . . ."

Nor have their hearts been stirred on beholding the hyacinth shadow of hills, the sweep and surge of the sea, sunglow and starlight, and the slow march of the seasons. They have continued on their uninspired way heedless of the glories which are their God-given heritage. They have not joined in the Psalmist's song: "The earth is full of the goodness of the Lord."

No matter how busy our lives we should take some portion of time each day to notice the things of beauty in our neighbourhood of which we have hitherto been unmindful. Practical activity is infinitely commendable, but it is not enough if we are to live up to the best that is within us, for without vision how can the spirit triumph? The people of the East are much wiser in this respect than we are. In the quiet contemplation of loveliness, in the realisation that

"The earth, with all its dust and tears,
Is His no less than yonder spheres,"

we shall find the answer to many of the problems that perplex us. We should make it our frequent petition: "O Lord, open Thou our eyes, and our lips shall show forth Thy praise."

One of the most delightful traits in children is their natural responsiveness to beauty. Their joy in discovering the wonders of Nature, their eagerness to learn, put many of their elders to shame. It should be the responsibility of every one of us who has been entrusted with the care of children that our charges do not lose that spontaneous quality of awareness as they leave childhood behind, for it is an invaluable bulwark against the storms of life. A noted writer of modern times has said: "A child-like man is not a man whose development has been arrested. On the contrary, he is a man who has given himself a chance of continuing to develop long after most adults have muffled themselves in the cocoon of middle-aged habit and convention."

The appreciation of beauty does not necessitate closing our eyes to ugliness and cruelty and injustice. It enables us to see with greater clarity the difference between right and wrong and, according to our measure of discernment, to strive to eradicate that which is evil. Neither shall we remain so blind to the suffering of our fellows. "The heart has eyes the brain knows nothing of," and as we learn to look beneath the surface and perceive the hidden hurts, the crippling anxieties and fears, ours may be the love and understanding which can minister to the needs of others and help them toward a life of true fulfilment.

Many

big style news for little women

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COUPON SAVERS . . .

Useful Aprons From The Ragbag

By EVA TOPPING, *Rural Sociologist, Auckland.*

DO you keep a ragbag? It is an institution in many homes, and odd pieces of material accumulate in it until it becomes almost a history of the family. Bundles of soft clippings from the baby frocks; scraps of worsteds, flannels, and serges from small pairs of trousers; pretty pieces from summer frocks tell the story of the children's progress, while odd bits of cretonne and furnishing materials record the changes the home has undergone. The bag grows fatter and fatter, for every piece of sewing done at home contributes a parcel of clippings, and a matching patch is always available for a worn place or to mend a tear. When the garments, curtains, or covers are worn out and discarded, what is to be done with the scraps that are left? Make some aprons to save frocks and coupons!

THE pieces of material need not be very large, for joins can easily become part of the design of the apron, or can be disguised with contrasting bands. The aprons illustrated can be put together easily in an hour or two, even if you haven't much needlework experience. They are pretty as well as useful, and if you don't need them for yourself they will make acceptable gifts for friends or for the next "bring and buy" stall.

Bib Apron

A fair length of material was available for this apron, as it was bought as a remnant, which was longer than was required for the frock. It is black and white printed cotton, which is a little dull for an apron and needs some colour to dress it up. Crossway strips cut from the good parts of a child's discarded playsuit of scarlet casement cloth were used to bind the edges and to make the strings at waist and neck. The diagram gives the measurements and shows how to cut out the pieces.

Bib apron.

To make up, first bind the top edges of the pockets, then set them on the apron 4½in. from the centre front fold and 5½in. from the top edge. Stitch the corners on very firmly as shown in the diagram, as they are likely to come in for a good deal of strain. The fullness of the skirt is set into three pleats on either side. Measure 2½in. from the centre fold and make the pleats on either side 1½in. deep; make the other pleats 2½in. apart and 1½in. deep. This will reduce the waistline to 27in., but if this measurement is too wide, make all the pleats a little deeper, keeping the same width between them. The waistband can be from 1in. to 2½in. deep and of the same length as the top of the apron skirt. It doesn't matter a bit if the waistband has to be joined several times to give the necessary length, and the lining can be of another material if you are short of the same kind to finish the job. Make strings of the binding material to tie at the waist and a loop about 23in. long for the neck.

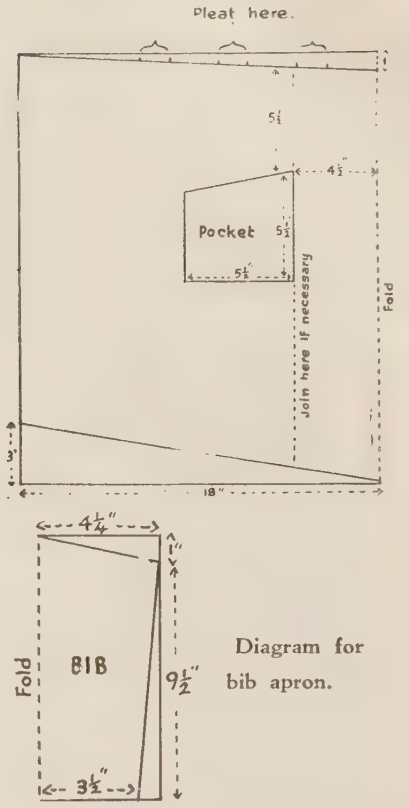


Diagram for bib apron.

Peasant Apron

This one was made from a length of primrose-yellow mercerised cotton, left over after making kitchen curtains which have long since outlived their usefulness; the trimmings are yellow and black checked gingham left after cutting out a washing frock. The waistband, which should be about 18in. long and 2in. wide at the centre front, was made from the selvedge pieces from the skirt parts, and the bands for trimming were contrived out of very small scraps joined together to give the right length. The diagram gives an idea of the sizes of the pieces required, but it is not necessary to follow it exactly.

If there is insufficient material in one piece to make the skirt, it can be joined at either of the dotted lines; the edges of the pockets will then fall along the seams. A 2in. hem is allowed for, making the apron 20in. long when finished. Another join

could run the full width of the skirt under a band of the trimming material to give sufficient length. The strings need not be long—just enough to tie at the back of the waist will do, or they could be made of the trimming material. The pockets can be omitted or made any other shape which fits the pieces of cloth available. If the hand can be inserted easily that is all that matters—it is a case of "cutting one's apron to suit the cloth."

Peasant apron.

The making is simple, but be sure to keep the lines of trimming straight and of even width. The bands were put on the yellow apron in three widths, 1¼in., ¾in., and ½in., but any number of bands in different widths could be used—it is entirely a question of how much material is at hand. The skirt is gathered into the waistband, leaving a straight section about 9in. wide in the centre, as shown in the diagram. Remember to slope the top

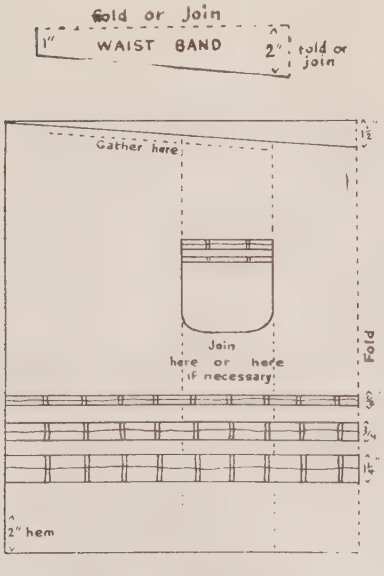


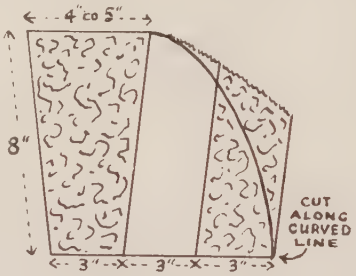
Diagram for peasant apron.

Apron made in sections.

edge of the skirt a little, as it makes the apron set better.

Sectional Apron

This is a gay affair which makes good use of small unconsidered trifles of material, for it is really patchwork. Several different materials can be combined if the colours blend, but keep the weights similar if you want the apron to wear well. Even the most worn-out garments sometimes yield a few good pieces of material, and this shape with its narrow sections will make use of the best parts of



Showing how bib for sectional apron is made.

discarded frocks, blouses, shirts, and even pyjamas. If you must use new and old materials together, first wash the new and put it into the front panels, which take the hardest wear.

In the apron illustrated the three central sections are 20in. long and 3½in. at the top widening to 9in. at the hem, but the two outside ones are 3½in. at the top and only 6in. at the hem. When joined five such sections will give measurements of about 15in. at the waist and 35in. at the bottom. But if the material will not allow these sizes, make seven narrower sections about 2¼in. at the top and 5in. at the bottom, or make the centre section wider and put narrower ones on either side.

The bib is made on the same principle of long patches. Cut the centre piece 8in. long, with the top edge 4in. to 5in. wide and the lower the same width as the top edge of the skirt section. Join straight pieces on either side to correspond with the skirt, and then shape the bib to your liking. Make a band to join bib and skirt after trimming the top edge even. Try the apron against the figure and note the bottom edge; you will probably decide to give it a curved line to make it hang better. Add strings at neck and waist, then hem or bind round all the raw edges.

The centre panel and alternate sections must be on the straight grain of the material, but the others can quite well be on the true cross or just off the straight.

All photographs by Sparrow Industrial Pictures Ltd.

SOLACE

Our child lies sleeping,
Dark lashes sweeping
Her petalled skin.
My days are filled with loving her,
For she is both of us,
And all the pain within
Is stilled for her.

Dear, now she's stirring,
Softly demurring
Against my light touch.
Your eyes would long to gaze on her,
For she is both of us,
And all the war's grim clutch
Is far from her.

You were there fighting
Till blood was writing
Your death on sand,
And anguish came to trouble her
Where she within the womb
Was all that love's dear strand
Had left to stir.

Heart empty, senseless,
Mind left defenceless
By cruel war;
But at the birth and joy of her
You lived again for me,
And love could bravely soar
To you, through her.

—See, now she is waking,
So softly shaking
Out of some dream.
And peace is in the eyes of her;
Dear one, I'll pray it stays,
And life in richest theme
Be lived by her.

—Margaret N. Kelly.

FAVOURITE QUOTATIONS

DISRAELI has said: "The wisdom of the wise and the experience of the ages may be preserved by quotation." Contributors to our competition this month are to be congratulated on their ability to quote "wisely and well," and though only a limited number of entries can be published here, it is hoped that the following selection will appeal as much to other readers as to those who have already chosen some of these particular items as their favourite quotations.

The first prize was won by "Wild Country," Te Pahu; "Chloe," Marlborough, and "Autumn," Canterbury, tied for second prize. Highly commended: "Njiniwa," Victoria, Australia.

First Prize

QUOTATIONS—the music of words that ring through our minds as we go about our daily tasks.

"Remember now thy Creator in the days of thy youth, when the evil days come not, nor the years draw nigh . . . While the sun, or the light, or the moon, or the stars be not darkened, nor the clouds return after the rain." (Eccliastes xii). Deep, beautiful, resonant.

Then a welcome to spring that befits my springtime mood:

Spring, the sweet spring, is the year's pleasant king;
Then blooms each thing, then maids dance in a ring;
Cold doth not sting, the pretty birds do sing. . . .
The fields breathe sweet, the daisies kiss our feet;
Young lovers meet, old wives a-sunning sit. (T. Nash, 1567-1607)

And this from the Song of Songs which is the Song of Solomon:

"Rise up, my love, my fair one, and come away. For, lo, the winter is past, the rain is over and gone; the flowers appear on the earth, the time of the singing of birds is come, and the voice of the turtle (dove) is heard in our land."

There sings the young heart.

Here, many centuries later in Venice, sings one that is weary:

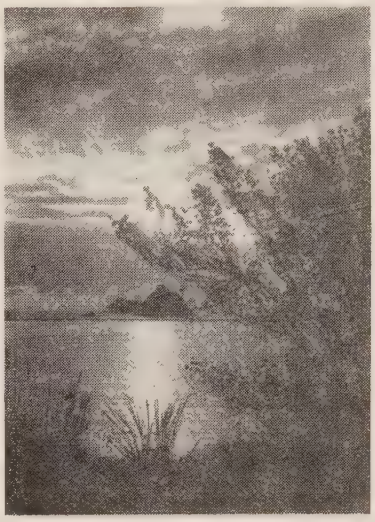
So we'll go no more a roving
So late into the night,
Tho the heart be still as loving,
And the moon be still as bright.

For the sword outwears its sheath
And the soul wears out the breast,
And the heart must pause to breathe,
And love itself have rest. (Byron).

And this from one who would not accept defeat:

"I offer hunger, forced marches, battles, and death. Let him who loves his country in his heart and not with his lips only, follow me."

It rings like Churchill, but is Garibaldi calling for volunteers for the retreat from Rome on July 1, 1849. On this retreat Garibaldi's wife, Anita,



" . . . . or the moon, or the stars be not darkened . . . . "

accompanied him as she had often done before; at its close she died.

"Blow out, you bugles, over the rich dead—
There's none of these so lonely, and poor of old
But, dying, has made us rarer gifts than gold." (Rupert Brooke).

Here is an extract from Isaiah:

"How beautiful upon the mountains are the feet of him that bringeth good tidings, that publisheth peace; that bringeth good tidings of good, that publisheth salvation; that saith unto Zion, Thy God reigneth."

I have set down so few of my favourites and have forborne from mutilating the poems of my beloved Elizabethans, so perfect in their entirety. The intrinsic value of any passage of verse or prose is an indefinable quality that makes it applicable to human lives, no matter if it was written yesterday or hundreds of years before our time. It is such passages which abide with us.

—"Wild Country," Te Pahu.

Second Prize (equal)

"This I have resolved upon, to wit, to run when I can; to go, when I cannot run, and creep when I cannot go." Pilgrim—from "Pilgrim's Progress."

This I selected from a bulging old scrap-book because it expresses very simply my own way of meeting life's problems. How often when there was love and tranquillity, happiness and peace of mind, life was joyous and I could "run" nimbly along its road. It was easy enough, too, to plod along, to "go," when there were only familiar difficulties and problems. But during these past few years how many of us have been faced with bitter grief or humiliation, defeat or great fear. How many of us have had to "creep" painfully along over a difficult, hazardous route, unfamiliar and dark. But we have kept on, as Pilgrim did.

I think his words imply a willingness to accept all experience and I think we must do that or else we shall never amount to anything. Facing things does help towards complete development. The unlucky people who meet only easy things will always remain undisciplined by life. They never grow up.

Often we cannot judge the worth of what happens to us until long afterwards. Then, looking back, we see that even the terrible things were somehow necessary. If we are willing to profit by experience it will help us to handle our adult responsibilities wisely.

When I am dismayed or facing a tough problem I determine that, like Pilgrim, "I will run when I can, go when I cannot run, and creep when I cannot go."

—"Chloe," Marlborough.

Second Prize (equal)

"How shall we judge their present, we who have never seen;
That which is past for ever, and that which might have been.
Measuring by ourselves, unwise indeed are we,
Measuring what we know by what we can scarcely see."

These lines from the poem "Compensation," by F. R. Havergal, have been to me for many years a reminder that every lot has its compensations. No one has all the joys or sorrows, all the benefits or disadvantages. The lot of a farm housewife is usually a very ordinary one and we are sometimes tempted to envy those who have great gifts or are more favourably circumstanced, forgetting that we see only the "outlined hills" of another's life and "never the vales between." The past, the hidden sorrow, the longings, the battle with temptation are all unknown to us, and perhaps, could we put our own joys and blessings in the balance with some of those

whom we consider so much better off, we would find the scales go down in our favour. Great gifts often entail years of hard study, struggle, and discouragement. Would we be willing anyway to exchange our lot with anyone else?—I think not.

Again by substituting the word "actions" for "present," I am reminded that it is unwise and unfair to judge others. So much enters into the make-up of every individual—heredity, training, circumstances—that we can never know all that has led to another's conduct. Measuring by ourselves, we are not competent to judge. The whole poem from which I have quoted is beautiful and inspiring and has often helped me to be content and tolerant.

—"Autumn," Canterbury.

"We ought to love everything into which God put life—and He made nothing dead. There is only less life in a stone than in a bud and both have a life of their own, and both took their life from God."

It was this regard for all living things which made Dr. Edward Wilson such an invaluable member of Scott's Antarctic Expedition, such an exact man of science, and such a staunch friend to all members of the party. This quotation serves as a constant reminder to me to maintain a balanced set of values, to keep things in their right proportions, and to avoid too much preoccupation with "this fussy thing called I." The ideas expressed thus by Dr. Wilson seem to me of very great importance, calling as they do for a respect for personality and for property and an awareness of our own kinship with all living things.

—"Celia," Marton.

Chinese Proverbs

The cup's in the hand—seize the hour ere 'tis fled!
How seldom in life is the moon overhead.
The sun cannot shine into an inverted bowl.

—"Parua," Northland.

If you have but two loaves, sell one and buy a lily.

—"E.W.," Waiheke.

More than fame, more than money, is the comment kind and sunny,
And the hearty, warm approval of a friend;
For it gives to life a savour and it makes you stronger, braver,
And it gives you heart and spirit to the end.

—"Dawn," Southland.

I will lift up mine eyes unto the hills from whence cometh my help.—(Psalm 121).

—"Poukai," Wellington.

A thought—good or evil—an act, in time a habit—so runs life's law. What you live in your thought-world, that, sooner or later, you will find objectified in your life.—(From "What All the World's A-seeking," by Ralph Waldo Trine).

—"Native Flower," Waipukurau.

A wet sheet, and a flowing sea,
A wind that follows fast,
And fills the white and rustling sail
And bends the gallant mast.

—(Cunningham).

—"Bella Rob," Putaruru.

If thou faint in the day of adversity, thy strength is small.—(The Book of Proverbs).

Sow an act, and you reap a habit;
Sow a habit, and you reap a character;
Sow a character, and you reap a destiny.

—"Cloudy," Ashburton.

Space Restrictions

THE "Good Neighbour" pages are suffering from a recurrence of a wartime malady, pressure on space. Supplies of paper of the quality on which the "Journal" is printed are very short, and the "Journal" has been temporarily reduced in size. I share the inevitable disappointment of contributors in the non-appearance of a wealth of interesting material, but the day is not far off when an expansion of the "Good Neighbour" section will be possible.

—*Mary.*

Competitions

AUGUST

August 15 is the closing date for your competition entry, "A Humorous Incident."

SEPTEMBER

So many of you have written in commenting on my "room with a view" that by way of returning the compliment I am asking you to describe the view from *your* home. A prize of 10/- will be awarded for the most vivid word picture, and there will be a second prize of 5/-.

"THE VIEW FROM MY WINDOW."

Entries must be in by September 15.

"MARY,"
"Journal of Agriculture,"
Box 3004, Wellington.

"God gives the bird its food, but does not throw it into the nest."

—"Vem," Frankton.

Oh, yet we trust that somehow good
Will be the final goal of ill.

—(From "In Memoriam," by Tennyson).

—"Alter Ego," Clinton.

Some books are to be tasted, others to be swallowed, and some few to be chewed and digested.

—(Francis Bacon).

—"Romulea," Upper Hutt.

Wish wisely and wish well, for what you truly wish will surely come to pass.

—"Tiggetty Boo," Kati Kati.

Then let us pray that come it may,
As come it will for a' that;
That man to man the whole world o'er
Shall brothers be for a' that.

—(Robert Burns).

—"Thumbs Up," Invercargill.

I shall pass through this world but once: if, therefore, I can do any kindness to any human being, let me not defer it nor neglect it, for I shall not pass this way again.

—"N.M.," Northland.

It is good to honour simple things, for they are the bricks that one by one build up the house of Life to stand staunch and indestructible for ever.—(Sheila Morris).

—"Glorianna," Hamilton.

Courage to face life and love to sweeten it.

—"Kahu," Shannon.

This above all—
To thine own self be true;
And it will follow, as the Night the Day,
Thou canst not then be false to any man.

—(Shakespeare).

—"Kismet," Nelson.

"Let us love life and fear not death, for souls do not die, but live eternally."—Chevalier de Boufflers speaking, in "Oriflamme," by Margaret Trouncer.

—"Old Reader," Coatesville.

Whene'er a noble deed is wrought,
Whene'er is spoken a noble thought,
Our hearts in glad surprise,
To higher levels rise.
Honour to those whose words or deeds
Thus help us in our daily needs,
And, by their overflow,
Raise us from what is low.

—(From "Lady with a Lamp," by Henry Longfellow).

If any compel thee to go a mile, go with him twain.—(Christ's Sermon on the Mount).

—"E.W.," Waiheke.

I want it said of me, by those who know me best, that I always plucked a thistle and planted a flower where I thought a flower would grow.

—(Abraham Lincoln).

—"Tui," Paeroa.

Rose leaves, when the rose is dead,
Are heap'd for the beloved's bed;
And so thy thoughts, when thou art gone,
Love itself shall slumber on.

—(Shelley).

—"Arethusa," Epsom.

Effect of Cooking on Food Values

KNOWLEDGE of food values brings another kind of evaluation to the ancient art of cookery. Not only must a dish be palatable, but it must contain the nutrients which build and protect the body and furnish it with heat and energy. Cookery thus becomes a science as well as an art. Some of the aims and methods of the older art need to be modified to be sure that the nutrients present in the raw foods are really there to be eaten, and in a form in which the body can make use of them, when they are cooked. Other traditional cookery practices withstand the test; they are based on a knowledge of nutrition which is a racial heritage built up by trial and error.

It may be useful to consider briefly why we cook food at all. According to some myths, it was by accident that man learned to apply heat to his food. He very rapidly learned to like his food cooked (and hot), which liking is now so strongly entrenched that it overrules the arguments—and there are some—against it. With some prevalent cookery practices there is a loss of vital properties, but there is also an undoubted gain where cooking makes food both attractive and appetising. Think of the delicious flavours developed during the cooking process in well-made soups and gravies; in roasted meat and vegetables; in the crisp crusts on bread and pastry and on foods fried in deep fat, as well as the more delicate flavours developed in oatmeal and other cereals by long, slow cooking.

IN this article Dorothy Johnson, Rural Sociologist, Christchurch, shows that not only good meal planning—as described in last month's "Journal"—but good cooking methods, based on the principles that have been introduced in this series, must play an important part in building up a good nutritional standard in the country. In both of these aspects women have a predominant interest. It is their skill which makes for the well-being of the people under their care.

There is little gain, however, when the flavour of foods has been spoilt by bad cooking. Who has not met flat-tasting boiled meats and stews, vegetables either mushy and tasteless or with a strong disagreeable taste caused by overcooking, pastry tasting undercooked, acrid foods fried at too high a temperature?

Palatability and Enjoyment

By cooking food we hope to increase its palatability and our enjoyment, which gives point to the cryptic saying that "Half the digestive ills of the world are caused by good cooks and the other half by bad cooks."

Some enthusiasts would go so far as to say that the cooking of food increases the happiness of mankind—"The aesthetic satisfaction brought about by well-cooked and appetising food served in pleasant surroundings also conduces to better digestion, shown by the greater secretion of the digestive juices and more movement in the digestive tract, which in turn produces the feeling of wellbeing and happiness." Conversely: "Food lingers in the stomach of the unhappy man beyond its appointed time, and, fermenting there, distends him with wind, embarrasses his heart, and hounds him over a prey to the fiends of gloom and discontent."

However, in that description it is difficult to discern which is cause and which is effect. One would need to find out the effect of badly-cooked

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WARNING
Diphtheria is about

A disturbing number of cases of this dangerous disease of children has been reported. Eighty notifications were received in a single week lately — eighty children struck down by a foe they could have mastered had they been immunised.

Since then an abnormally high rate of incidence has been maintained.

If your child is not immunised against diphtheria, have him attended to at once. The best time is between the ages of 6 and 12 months.

It can be done, through the Department of Health, at schools, at pre-school clinics, and at District Health Offices; or your own doctor will do it for you.

But don't delay—

DIPHTHERIA CAN BE DEADLY!

KEEP THIS ANNOUNCEMENT FOR FUTURE REFERENCE.

22b

FOR A HEALTHIER NATION

meals on the constitutionally happy man, and whether the gloom of the unhappy man could be dissipated by attractive and well-cooked meals. It is a complex relationship.

Preservation by Cooking

The second reason for cooking food is to preserve it. Scalding milk or cooking a joint stops, for a time, its tendency to go bad or putrefy. Between producer and consumer all food at some time becomes the home and breeding place of microbes. They get into meat, milk, and vegetables, turning them putrid, sour, or mouldy. If their invasion is prevented by cleanliness the keeping properties of food are increased. If they have already intruded, we destroy their life by heat so that for a time the food is still fit for consumption. Food which is sterilised and tinned—food in which all microbes have been destroyed and no more can have access —will keep indefinitely, and can be sent from one end of the world to the other.

Aiding Digestion

Cooking makes the nourishment in some foods more readily available. In meat, for instance, the fibres are more easily separated, and so the digestive juices are more able to penetrate and make the meat soluble. The same is true of grains. When starchy foods are cooked, the grains swell with the absorption of water and the envelopes round the grains split. In this condition the starch can be digested in the mouth by the saliva, turning the insoluble starch into a soluble sugar. Uncooked starch has to wait till it reaches the small intestine some hours later.

The advantages in cooking these foods, however, are offset by the decrease in digestibility in cooking others, and by the loss or destruction of valuable food materials. Eggs and cheese can be made harder to digest by wrong cooking. In frying, the fat coats the particles of food with a film which is impervious to the digestive juices, so digestion of the food is delayed till the fat is split up in the small intestine.

The loss of food materials occurs most readily in cooking vegetables when the valuable mineral salts are partly washed out by boiling and thrown down the sink with the water. These disadvantages can be lessened by altering the methods of cooking, and serving some foods in a fresh and uncooked state preserves intact their mineral salt and vitamin values. For the rest, the aim of cooking is to increase the palatability and digestibility while keeping as much of the food value as possible. Because of the difference in the chemical nature of each of the nutrients (protein, fat, starch, minerals, and vitamins) dif-

ferent methods of cooking are required.

Cooking of Protein

Heat causes most proteins to coagulate or set. When an egg is poached or fried both white and yolk become firm. The same thing happens with meat and fish, but the protein is in fibres bound together by connective tissue which softens in the presence of moist heat.

Experiments have shown that coagulation of protein takes place below the temperature of boiling water, and that the more the temperature is raised above that point the harder and tougher the protein becomes. The general rule is to use low temperatures for protein foods.

In cooking eggs, place them in a pan of boiling water, put the lid on, and remove from the source of heat for ten minutes. Three eggs need a pint of water.

Custards should be cooked at a low temperature. The stored heat in an electric oven will cook a custard without curdling it after the joint is taken out.

Even meat can be baked at a lower temperature than that indicated by most cookery books. In a joint loss of food value is avoided because the heat coagulates the protein on the surface and seals it up. There is no need to have the oven over 325deg. But it will take a longer time for the meat to be cooked through to the centre. The palatability of meat is greatly increased by cooking. New flavours and attractive odours are developed in the process.

Cooking methods for meat and fish will be treated in more detail in later articles. They constitute the techniques of the **art** of cookery, while this article deals more with the **science.** But the two cannot be entirely separated.

Effects of Fat

At high temperatures fats are split up into substances which are very irritating to the eyes and nose. Few cooks have escaped the experience of burning a roast or overheating frying fat.

In normal cooking processes fat just melts, and improves the flavour of the food and the texture of baked goods as well. It tends to cause indigestion if it coats protein and starchy foods.

Making Starch Soluble

Starch is an insoluble substance which has to be turned into a soluble form to be used in the body. By breaking the envelopes round the grains, cooking makes it possible for the digestive juices to come in contact with the starch to bring about the fairly long series of chemical changes.

As the starch absorbs liquid in the cooking process it swells, bringing about the characteristic thickening in porridge, sauces, and cereal puddings. We depend on this characteristic of starchy foods in a great variety of ways to increase the palatability and attractiveness of cooked dishes by serving them with well-made sauces and gravies. The food value of a vegetable is increased by the thickened sauce that accompanies it. Dry and insipid foods are improved by sauces, either sweet or savoury. Cereal puddings can be moulded into attractive shapes.

Danger of Losing Minerals

Minerals are not changed in the process of cooking; they are simply in danger of being lost, as most of them are soluble in water. Those in meat are safe. as the minerals are imprisoned with the juices when the outside protein is sealed in baking, grilling, or frying. When meat is stewed they are in the thickened liquid, which is eaten too.

It is in vegetables that the greatest loss can occur.

Vitamins

Vitamins A and D are more stable to the cooking process than vitamins B and C, which are destroyed by heat, especially in the presence of alkalis like soda, and can be lost because they are soluble in water.

There is a substance in the plant which destroys vitamin C; it starts to act as soon as the plant is gathered and continues till it is itself destroyed by boiling. This means that the sooner a vegetable is cooked after picking the better.

Neither vegetables nor fruits should be cut up for any length of time before cooking, as the breaking of the cell walls causes this substance to come in contact with the vitamin.

Cooking of Vegetables

More damage is done to the food value of vegetables by the commonly-accepted methods of cooking than to any other foodstuff. Raw vegetables are rich sources of vitamins and minerals, but it is astonishing and dismaying how much uncooked and cooked vegetables may differ in food value. As much as half the minerals and a large proportion of the vitamins may be lost in the cooking water.

The aim of cooking vegetables is to increase the palatability, but at the same time to keep as much of their natural colour, flavour, texture, and food value as possible. How can it be done?

Retaining the Colour

Green, leafy vegetables contain a colouring matter called chlorophyll which is slightly soluble in water (think of the colour of spinach or silver beet water) but turns brown when heated in the presence of acid. All vegetables contain at least traces of acids, but they are volatile and escape with the steam. Soda, an alkali, intensifies the colour, but it results in the loss of both texture and food value.

The pigment in red vegetables is very soluble in water, but in this case acid intensifies the colour and alkali destroys it. So add a teaspoonful of lemon juice or vinegar to beetroot or red cabbage during cooking.

In white vegetables such as celery, cauliflower, potatoes, and onions there is a colourless substance which turns yellow when heated with soda or **when the vegetable is cooked too long.**

The yellow pigment in vegetables like carrots and pumpkin is fairly stable and only slightly soluble in water, so these vegetables need no special attention.

Texture and Flavour

All vegetables are softened to some extent by cooking. The aim should be to make them tender, but not mushy, which condition the addition of soda brings about. Therefore avoid overcooking and the use of soda.

RICH CARGO

Your good ship, exulting, will speed on its way,
When stoked well and wisely with foods rich in A,
With good fats and plant foods both yellow and green,
For these are the ones with the most carotene.

Have spinach and pumpkin, tomatoes and fruits,
Swede turnips and carrots and such yellow roots,
All green leaves and liver and egg yolk and cheese,
And fish-liver oils which are richer than these.

Have milk with your porridge and butter with bread,
Especially when cows on green pastures have fed,
For vitamin A when it's stored in the hold
Is cargo to carry more precious than gold.

—Lilian Fraser Smith.

Spinach leaves cook in 3 to 8 minutes; either cook the stems separately (including the pink part at the junction of the root) or cook them 5 minutes first, then adding the leaves cut up. Cabbage takes 6 to 9 minutes.

One writer makes this statement: "Almost everyone, if choosing between an overcooked and an undercooked vegetable, would prefer the undercooked one, first of all for appearance, second for texture, and third for flavour." Do you agree with that statement? Would you qualify it by saying that it is as undesirable to undercook beetroot and potatoes as it is to overcook cabbage, spinach, onions, or cauliflower?

With the possible exception of strong-juiced vegetables like onions, the flavour of uncooked vegetables is preferable to that of cooked vegetables, so the aim in cooking should be to keep as much as possible of the original flavour. It is best preserved when vegetables are cooked whole in their skins for the shortest time possible, and served as soon as they are cooked.

Onions cooked for an hour lose their flavour. Cabbage cooked for the same time not only develops an unattractive brown colour but has a new, disagreeable flavour and becomes very difficult to digest. Cauliflower reacts in a similar manner.

Cooking for Food Value

Summarising our knowledge so far, it can be seen that to get the maximum food value from cooked vegetables we need to:—

1. Prepare them just before cooking.
2. Cook them a short time in as little water as possible, or bake them unpeeled.
3. Avoid the use of soda.
4. Keep them whole. If they must be cut, cut them lengthwise, not across, to minimise loss of the juices.
5. Use in gravies, sauces, soups, or cocktails all the liquid remaining.
6. Eat the vegetables as soon as they are cooked.
7. If cooked vegetables must wait for late-comers, cool them quickly and reheat when required.

Present practices may include one or all the following errors:—

1. Too long storage of fresh vegetables before using.
2. Soaking prepared vegetables before cooking.
3. Cooking in too much water.
4. Overcooking.
5. Discarding the cooking water.
6. Preparing and cooking vegetables too long before serving.

All these points can be illustrated by the modern method of cooking cabbage. The homely cabbage is a valuable vegetable. It is easy to grow practically all the year round. When young it makes crisp and attractive salads. When cooked in the modern way, according to the principles described, it is a valuable source of minerals and vitamins, especially vitamin C, because more cooked cabbage than raw cabbage or lettuce can be eaten.

Ideally, a cabbage should be growing in the garden till within half an hour or an hour of dinner time. Have ready a saucepan containing ½ to 1 cup of **boiling** water, ¼ to ½ teaspoon of salt, and 2 to 4 teaspoons of butter, according to the quantity of cabbage. Begin cutting up the washed cabbage, or rather shredding it as though for salad but not so finely. When a handful is cut up put it into the boiling liquid and put the lid on. As soon as the next handful is cut put that in the saucepan, replacing the lid. Repeat till all the cabbage is in the saucepan, taking care that **the contents of the saucepan do not go off the boil.** It will be cooked 5 to 7 minutes after the last handful goes in. It is useful to turn the last lots under the first ones before replacing the lid for the last time. Usually the liquid is all absorbed, but if it is not drain it carefully into a glass and drink it yourself. It is the cook's prerogative to have the delicious titbits.

This method gives the substance that destroys vitamin C no chance at all. It has no time to act before the cabbage is cut up and it is immersed in boiling water immediately after. The cabbage cooks in the steam, and the lifting of the lid gets rid of any volatile acid that might destroy the colouring matter. The colour of cabbage cooked in this way is most attractive, the texture is neither tough nor mushy, and the flavour is delicious. Dripping or a tablespoon of hot fat from the meat can be substituted for butter. There is just time to make the gravy and dish the other vegetables before the cabbage is ready.

This method suits other young fresh vegetables. It does not take as much time as the older method, and it creates no kitchen smells so attractive to big flies.

Fruits

When preparing fruits for the table

1. Use them raw wherever possible.
2. Cook only the shortest time.
3. Do not stir or sieve them hot.
4. Sweeten them after they are cooked.

There is probably some vitamin C left in bottled fruit if it is preserved by the cold-pack method—that is, if raw fruit is packed into the jar, water or syrup poured over, and the processing done in the oven or in a water bath. If the fruit is stewed in an open preserving pan and then bottled very little vitamin C is left.

Nutritionally it pays to bottle tomatoes, which retain more vitamin C after the process than other fruits because of their acid nature. But, after all, fruit in the middle of winter, when it is bottled straight from one's own trees, is an attractive and desirable addition to the meal apart from its vitamin content.

If country people need to be persuaded that well-stocked vegetable gardens and orchards are fundamental necessities of their mode of life, it is hoped that this description of some of the results of modern research in nutrition will have convinced them. To maintain the dietetic standards that should be general in this favoured country, the provision of fresh vegetables and fruits can be possible only if they are grown on the farm. Storage and long transportation, except under conditions not likely in this country for a very long time, bring about too serious deterioration. To grow them is a better investment of time and energy, even if it means producing less for sale. It will probably necessitate a change in habits—but that is the subject of another article.

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I ENJOY the "Journal" very much and wish to join your "At Home," please. My main interests are my home and garden.

—**"Lamakin," Wyndham.**

POOR "Lonely Londoner"—are you really lonely or have you found good neighbours and friends in your new home? I hope so. I have only been to London a few times, mostly at Christmas to see all the marvellous toyshops. How I used to gaze and gaze at the rows of beautiful dolls' houses and furniture—everything any civilised doll could possibly want, in tiny, exquisite replicas of adult possessions.

—**"Whispering Bamboos," Bethlehem.**

I FEEL as if I know you quite well, really, for no matter how busy I am, as soon as the "Journal" arrives I make time to sit down and read the opening page of the "Good Neighbour" section. I think you have one of the most precious possessions there is: the ability to put into words that which most of us feel, but are incapable of expressing. I should very much like to join your circle.—**"Blue Orchids," Manurewa.**

I FOUND the article on the making of soups very useful, and am becoming a "soup enthusiast," though I think there is nothing quite so nice as tomato soup made from one's own tomatoes.

We have had some glorious autumn days, warm and windless, and after six years in New Zealand I have decided that your autumn is the most pleasant of the seasons. It is always so very windy in the spring, and the summers have been so uncertain, but each year another lovely autumn has come, putting off the dark winter for a spell.—**"Homespun," Halcombe.**

THE "Journal" is in great demand by the various members of the family. I always look first for the "Good Neighbour" section, as it is so interesting; so now I have decided to join your happy circle, if I may. We are not a country family, but are most interested in the soil and hope one day to be possessors of a few acres of our native land.—**"Buttercup," Invercargill.**

I WONDER how many "Good Neighbours" have read Fay Inchfawn's books, "Homely Talks of a Homely Woman," etc. Many a time when homesick and weary I have picked up one of her books and found inspiration and help. It is marvellous how she gives a silver lining to the humdrum jobs of every day, making you feel that washing up, bed-making, and the like are privileges instead of bogies.—**"Magdalene," Invercargill.**

I WOULD like to join your "At Home," please. I enjoy the "Journal" very much. The March number with the "Hills" article was really beautiful—I, too, love the hills.

—**"Dawn," Southland.**

FLOWER PICTURES

THE girl who lives down our road has very poor health and spends long periods lying in the sunporch. Whenever we can we take her along little things to help break the monotony. She is very fond of flowers, so when something new comes out we pick her a sample. And sometimes our flowers are given back to us, usually at Christmas and birthdays, as

this young lady is very clever with her needle and makes truly artistic copies in needle embroidery or tapestry which she has made up into lovely little bedroom pictures. So far, she has done primroses, wallflowers, roses, and delphiniums which are most lifelike and a joy to all who see them. I often wish I could do the same.—**"Balranald," Aranui.**

THE little things in life are often not appreciated until something forces them upon our notice. We have recently been in quarantine and, believe me, we had to depend upon our good neighbours for everything. Each magazine or paper which arrived was pounced on—anything from the outside world was important. A wedding invitation, a postal note for a par. accepted—these were exciting, but best of all was a 'phone call to say we could collect our small patient.—**"T.A.," Paeroa.**

The Plunket Tradition

SOME time ago we bought 18 sheep which later provided us with 16 lambs. Thus we have realised one of our ambitions: we are now sheep-farmers, though on a minute scale, as yet. I do not think I have ever spent a more interesting three months than in watching the antics of these ewes and their offspring. Some of our fences were none too sound, and I had to spend a considerable number of hours keeping the sheep out of our neighbour's garden. I also had a pet lamb, one of a pair who arrived on a

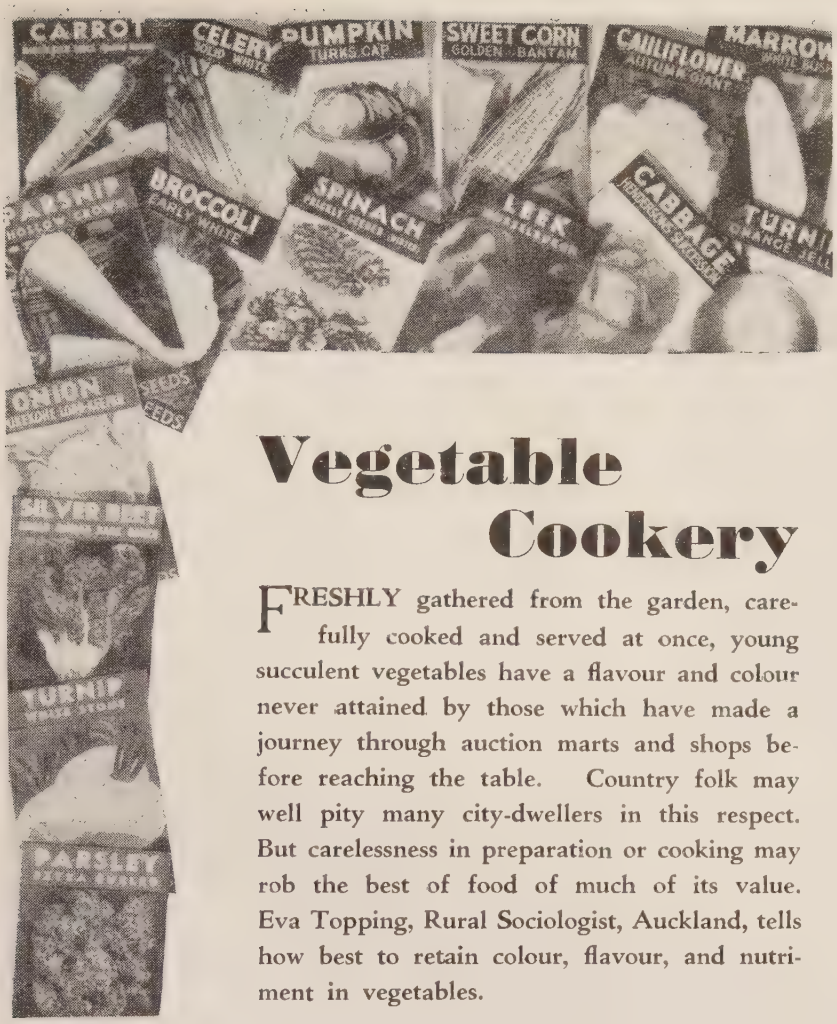
drenching wet day, and as their mother could not feed them both, I undertook the care of Topsy. Knowing nothing of such matters, I thought I had better bring her up in the Plunket tradition, so I started her off with six meals a day, at three-hourly intervals, and you can imagine my pleasure when the very course I had adopted was recommended in the "Journal of Agriculture." For many weeks Topsy slept in a kennel, and though she is now back with her companions, she has not forgotten me.

—**"Francisca," Westland.**

The eternal feminine

You're feminine once more dear lady,
so put away your overalls
and think about your underalls —
every one a Berlei — for the brave new line
is exciting but exacting
with its upswerving bosom
and its incurving waist.
(You'd never get by without a Berlei).
To arms then! The war may be done
but the struggle's just begun;
curves, curves, curves are on parade!
(Courage lady — just enlist a Berlei's aid).

Berlei
TRUE TO-TYPE FOUNDATIONS



Vegetable Cookery

FRESHLY gathered from the garden, carefully cooked and served at once, young succulent vegetables have a flavour and colour never attained by those which have made a journey through auction marts and shops before reaching the table. Country folk may well pity many city-dwellers in this respect. But carelessness in preparation or cooking may rob the best of food of much of its value. Eva Topping, Rural Sociologist, Auckland, tells how best to retain colour, flavour, and nutriment in vegetables.

VEGETABLES add colour, flavour, and variety to any meal, and because of their store of vitamins and minerals they belong to the protective group of foods and should be served every day—raw for salads, freshly cooked, or preserved. Part of the vitamin C content—the fresh fruit vitamin which is so necessary for good health—is destroyed by poor methods of cooking and preparation, and a proportion of the valuable mineral salts is dissolved into the cooking water and thrown away. Often what arrives on the plate is the least valuable part. To retain the best flavour and the maximum of food value it has been found that following these rules gives the best results:—

Use everything as fresh as possible; if the vegetables are home grown, gather them on the day they are to be used.

Wash thoroughly but do not soak for long periods; even a very tight head of cabbage needs no longer than half an hour in salted water.

Scrub root vegetables with a stiff brush; for young carrots and new potatoes little further preparation is necessary, but older and thicker-skinned varieties can be peeled thinly.

Take off only the wilted and tough leaves of cabbage, as the green outside parts contain a greater proportion of vitamins than the lighter-coloured heart. Outer leaves that are too tough to be put in the pot can be shredded for soups and stews—not to save the vegetable but to gain the greater nutritive value of these leaves.

Cook in a **little** water—just sufficient to prevent the pan from burning.

Keep the lid on the saucepan while cooking so that steam does not escape.

Photograph in heading by Sparrow Industrial Pictures, Ltd.

Put vegetables into ready salted, boiling water and cook quickly but for only long enough to make tender. The time varies with the age and texture from ten minutes for young green peas and sweet corn to forty-five minutes for old, tough-fibred roots.

Use salt in proportion of 1 teaspoon to 1 quart of water.

Put vegetables into a pot gradually so that the water keeps boiling. This will retain the natural colour.

Pour off the liquid and use it to make gravy, for stews and soups, or for part of the liquid for making sauce to serve with the vegetable.

Serve vegetables at once, as keeping them hot causes rapid loss of vitamin C. Do not use soda, as it causes loss of vitamins B and C.

Some varieties of vegetables bake well, as they are naturally moist enough. Baking in the skin preserves almost all the vitamins and minerals. Potatoes, pumpkins, marrows, onions, kumaras, chokos, and parsnips can all be baked in the roasting pan with the meat, or in a tin with fat or a little water. Beetroot can also be baked but require neither fat nor water; put them unpeeled on a tin away from fierce heat and leave them in the oven until they feel tender and the skin slips off when pressed with the fingers.

Serving for Interest and Food Value

For interest, as well as food value, serve three vegetables together, potatoes or something similar (kumaras or Jerusalem artichokes); a green leaf vegetable (cabbage, spinach, Brussels sprouts, turnip tops, or silver beet); and a red or yellow one such as carrot, swede, parsnip, pumpkin, or corn. White vegetables like celery, leek, turnip, and cauliflower can be served with parsley sauce if additional colour is desired. Be generous with the parsley, or use it finely chopped and sprinkled over the vegetables just before sending them to the table.

The time for cooking vegetables depends on the size and age to a great extent; a time-table cannot be relied on entirely. Test boiled and steamed vegetables with a two-pronged steel fork, skewer, or metal knitting needle. Baked vegetables can be tested in the same way or by pressing with the fingers. On the next page is a list of the more usual vegetables, with methods of preparation and approximate cooking times.

VEGETABLE COOKERY CHART

	Preparing	Boiling (minutes)	Baking (minutes)
Asparagus	Cut off the coarse fibrous part of the stalk (use this in soup or stew), wash, tie in bundles, and cook upright.	15-30	—
Beans	Remove tops, stalks, and strings (if any), cut into pieces or shred coarsely.	15-30	—
Beetroot	Wash without breaking the skin; leave on the tap root and 2in. of stalk to prevent "bleeding."	40-60	60
Brussels sprouts	Take off the wilted leaves, cut the stalk, and stand in salted water for ½ hr.	10-15	—
Cabbage	Take off wilted and very coarse leaves, cut in quarters, remove the core if "woody," and stand the cabbage in water for ½ hr. Shred immediately before cooking.	20-30	—
Carrots	Scrub and leave whole if young; scrape old ones and cut into quarters, slices, or strips.	new, 20 old, 20-30	— —
Cauliflower	Cut off tough outside leaves and hard core, break into pieces for quicker cooking if it is a large head.	20-30	—
Choko	Peel, cut in half, remove centre and seed.	20-30	30-40
Celery	Use coarse outside stalks, wash well and cut into 3in. pieces; stand in water to crisp.	20-30	—
Jerusalem artichokes	Wash and peel thinly, stand them in salted water to prevent discoloration.	30	—
Kohl rabi	Wash and peel, cut into ½in. slices.	25-30	—
Kumaras	Wash and peel for boiling, or leave the skins on for baking.	20-30	40-50
Leeks	Wash carefully, as soil works down to the base of the leaves; cut off the roots and coarse top, leaving as much of the green part as will be tender when cooked. Cut into 2 to 3in. lengths.	20-30	—
Marrow	Peel, remove seeds, and cut into convenient pieces. Very young marrows can be cooked with skin and seeds intact.	15-20	30
Onions	Peel under water and cut; for baking medium-sized onions may be left whole.	30	40
Parsnips	Scrub, peel if old, cut into quarters or slices.	25-30	30-40
Peas	Shell, and wash if necessary.	15-25 according to age	—
Potatoes	Scrub, scrape, or peel, according to age and method of cooking.	25-30	30-60
Pumpkins	Remove skin and seeds, cut into pieces of convenient size for serving.	20-30	40
Silver beet, green leaf	Wash well in several waters; shake off some water and put into a pot without adding more.	15-25	—
Silver beet, white rib	Cut into pieces and boil; serve as a separate vegetable with parsley or cheese sauce, or use white and green together.	15-20	—
Spinach	Wash well, changing the water several times, and cook without added water.	10-15	
Swedes	Wash, peel, cut into ½in. slices or small sections.	30-40	
Sweet corn	Remove husks and "silk."	10-15	—
Tomatoes	Wash, scald, and dip in cold water if required to be skinned.	15	30-40
Turnip roots	Wash, peel, and cut into pieces.	30	—
Turnip tops	Wash in several waters.	30	—

Steaming is a satisfactory way of cooking vegetables, as less food value is lost by this method. Allow a little longer time than for boiling.

For a sauce to serve with leeks, cauliflower, onions, or white rib of silver beet:—Melt 2 tablespoons of butter in a saucepan and gradually stir in 2 tablespoons of flour. Add 1 cup of liquid—half vegetable water and half milk, or all vegetable water—stirring carefully all the time to prevent the sauce becoming lumpy. The vegetable water will be sufficiently salted, but add pepper to taste.

If you are saving butter for Britain, make the sauce this way:—In a basin mix 2 tablespoons of flour with a little cold milk until it is quite smooth. Stir briskly—a fork will be found easier to use than a spoon. Add the cup of liquid, stirring constantly. Pour into a small saucepan and stir until cooked and smooth. Chopped parsley or chives or grated cheese may be added just before cooking is finished.

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Food for Britain

I WAS born in London, in the district between St. Mary-le-Bow and Highgate Hill, where Dick Whittington sat on a stone to hear the famous bells, usually known as Bow Bells. Many people have followed his example and travelled far away to seek their fortunes, though mostly without the wonderful results he achieved. However, no one needs to be ashamed of being a cockney, not even when our famous accent is ridiculed. Now, we can be very proud to be connected with our fellow-cockneys, who remained to defend the city of London with all its proud history and traditions.

We may not be able to do as much good as Dick Whittington did when he returned with his fortune, but we can do our best to improve the food position for those whose cockney wit and courage have been an example to us all during the war years.

—"Cockney," Greymouth.

SUSSEX IN THE SPRING

HAS any fellow-reader been down to Sussex in the spring and walked over the South Downs to Chanctonbury Ring, finding harebells and cowslips on the way, and the sweetest-scented, pinky-white violets growing beneath the hedges, and seen hundreds of baby rabbits scudding to their burrows the instant they caught sight of you? We live in a valley with an old wooden windmill facing us on one hill, and the Downs outside our gate.

—"Whispering Bamboos," Bethlehem.

Combating Pests and Diseases of Chrysanthemums

LAST month the cultivation of chrysanthemums for garden display was described, but it was pointed out that results are often disappointing because of the ravages of the chrysanthemum eelworm and certain other diseases and pests. The way to avoid or cure these troubles is described below by J. P. Hudson, of the Horticulture Division. To grow really good garden chrysanthemums is worth a little trouble, as they will make the garden bright for weeks in the late summer and autumn.

Chrysanthemum Eelworm

HUNDREDS of years ago the expert Chinese growers of chrysanthemums insisted that a plant was not healthy unless the stems were still furnished with green leaves down to ground level when the bloom was fully open. How often is a chrysanthemum plant seen in that condition now? The lower leaves on the stem should not go brown and wither before the flowers open, nor should leaves be parti-coloured, yet gardeners are so familiar with these symptoms that many regard them as quite normal. They are usually a sign that the plants are attacked by the chrysanthemum eelworm (*Aphelenchoides ritzemabosi*), a microscopic animal which was first recorded as attacking chrysanthemums in New Zealand in 1935, though it had probably been present for some time before then. The eelworms can live for years in the soil and attack any chrysanthemum planted near them by swimming up the stem in the film of water on the surface of the plant in damp weather.

The eelworms enter the leaves through the pores, multiply enormously, and cause dark patches, which later go nearly black, until ultimately the whole leaf withers up and hangs down the stem before dropping off. The lower leaves are usually attacked first, but as the attack spreads other leaves higher up the stem show the symptoms until, in a badly-affected plant, there may be no healthy green leaves at all. In cases like this, of course, the flower will be useless, and even when the attack is less severe the blooms may be of very poor quality.

Flower buds and outer layers of the stems may also be attacked by the eelworm, causing brown areas on the stems and blindness of the buds, or small, weak, or twisted flowers with but a small number of petals.

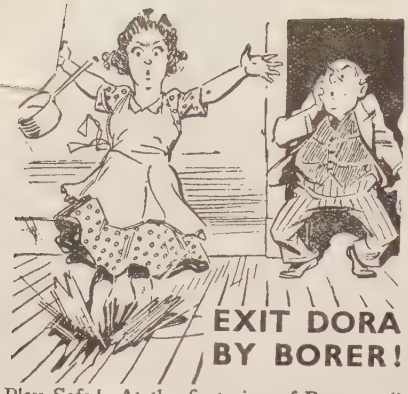
Throughout the season there is a constant "traffic" of eelworms, up the stem to infest new leaves, and downward, a proportion of the eelworms returning to the soil. The migration takes place when the plants are damp, which accounts for the fact that the most severe attacks of eelworm are associated with wet seasons. When infected leaves fall off the eelworms within them are returned to the ground, where they may remain dormant for at least three years and still be capable of attacking chrysanthemums planted nearby.

During the winter the greatest concentration of eelworms will occur on or near the stools of plants which have been affected, and these eelworms infect the new shoots (which will be used for cuttings) as they appear.

The stem of a healthy chrysanthemum should be furnished with green leaves to ground level. When the lower leaves go parti-coloured, wither up, and fall, as shown above, the plant has been attacked by the chrysanthemum eelworm.

Attention to the following points will help to keep the pest in check in the garden:—

1. Collect dead leaves from the stems throughout the season, before they fall to the ground, and burn them.
2. Burn all old flowering stems when they are cut down; do not put them on the compost heap.
3. When stools are lifted, or cuttings or rooted suckers are prepared for planting, wash them thoroughly and then dip them for a few minutes into nicotine solution containing 1 fl. oz. of nicotine sulphate, 2oz. of soap and 4 gallons of water. (This treatment is not as effective as the hot-water treatment of stools described later.)
4. If possible, root cuttings in soil in which chrysanthemums have not been grown before. If this is not practicable, use sterilised soil.
5. If chrysanthemums have been very badly affected, especially when they have been grown in a border for years, it may pay not to grow chrysanthemums or other susceptible plants there for two, or preferably three, years, thus "resting" the ground. This should lead to a considerable reduction in the eelworm population in the soil of the border.
6. Plants of asters, delphiniums, dahlias, rudbeckias, Michaelmas daisies, *Phlox Drummondii*, etc., may also be attacked by this pest. If any of these show symptoms similar to those described for chrysanthemums, the affected plant should be dug up and burned.
7. It has been suggested that upward movement of the eelworm from the soil to the plant can be prevented by smearing a ½in. ring of petroleum jelly or grease-banding material around the stem a few inches above ground level. While fresh the ring no doubt serves this purpose, but it rapidly becomes covered with dust and splashes of earth thrown up by rain. To be effective the rings must be renewed from time to time. Care



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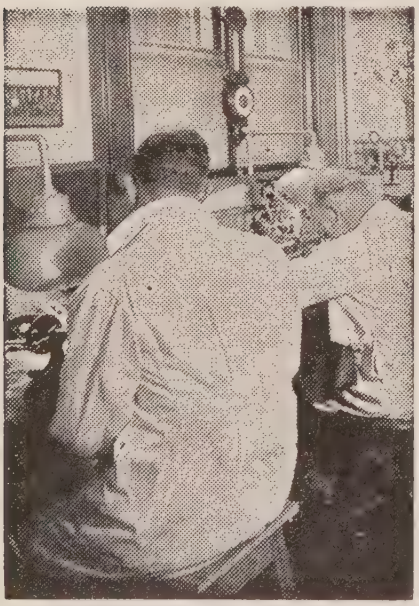

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must also be taken to see that the lower leaves of banded plants do not touch the soil or other plants, and that water does not splash from one plant to another, as that would carry eelworm infection.

8. If it is essential to grow chrysanthemums in an infected border, the scale of attack can be kept to negligible proportions by spraying the plants regularly, every two weeks throughout the season, with nicotine solution (see paragraph 3). Though this will not, of course, kill eelworms inside the leaves, it will prevent to a large extent the migration of the pest up the stems, and so reduce infection of the upper leaves. The ground round the plants should be thoroughly wetted with the spray fluid each time the plants are sprayed.

The measures suggested are all worth while if eelworm is causing trouble in the garden, but they are preventive rather than curative. By far the most effective cure is to cut the stems down to about 4in. when the flowers are over, wash the stools thoroughly, and then immerse them for 20 minutes (30 minutes for stools with very thick stems) in water at a temperature of 110deg. F., afterward plunging them into clean, cold water to cool off.

This hot-water treatment kills all eelworms in and on these stools without affecting the plants. If stools thus treated are then planted out (and the cuttings subsequently inserted) into sterilised soil or soil free from eelworm, perfectly clean plants can be produced.

To attain the temperature of 110deg. F. as soon as possible, the water should be a few degrees warmer when the stools are first thrown in. In small baths it may be as high as 116deg., but in larger baths 112 to 115deg. will usually be hot enough to allow for the first drop in temperature caused when cold stools are thrown in.

The most satisfactory thermometer to use is a floating dairy thermometer, which is relatively inexpensive. The cheaper thermometers are rarely accurate enough for checking the temperature of hot-water baths for plant treatment, where the temperature must be controlled to within a degree or less. The thermometer should therefore first be checked against one known to be accurate.

Buckets of hot and cold water should be kept by the bath to correct too-rapid fluctuations of the temperature, which should not be allowed to rise above 112deg. F. or to fall below 109deg., but should be kept as near to 110deg. as practicable.

The chrysanthemum eelworm causes dark patches to appear on the leaves, which later go nearly black and wither up. A healthy leaf is shown in the bottom right-hand corner.

Those who use this hot-water treatment regularly will agree that this is not as difficult as it sounds.

Stools which have been given the hot-water treatment are about three weeks slower than usual in producing cuttings. Allowance should be made for this delay if cuttings are required on a certain date, as for show chrysanthemums.

Unfortunately, unrooted cuttings cannot be given the hot-water treatment, as it usually kills them; but rooted cuttings can be tied in small bundles, surrounded by moss, and treated in the hot-water bath, if this is more convenient than treating stools. Some of the leaves may turn brown after treatment, but the cuttings will soon produce healthy, clean leaves.

Rust

Rust (*Puccinia chrysanthemi*) is a widespread and serious disease of chrysanthemums in New Zealand. It is easily recognised from the appearance on the leaves, mainly underneath, of chocolate-coloured powdery blisters. Some varieties of chrysanthemum are more susceptible to this disease than others, and varieties which are badly attacked are better not grown in the garden. The disease is carried from year to year on the old stools and in the cuttings, and if cuttings are taken only from healthy plants the disease is not likely to cause much trouble. If rust is present in a garden, it is best to dig out and burn very badly-infected plants, pick off and burn other infected leaves if practicable, and dust the remaining foliage frequently with flowers of sulphur.

To combat a severe attack on a commercial scale, Bordeaux mixture would undoubtedly give the best protection to leaves not yet attacked, but its use is undesirable on ornamental plants. A suitable spray can be made by dissolving 1¼oz. of liver of sulphur in 14 pints of water. Then make 1½oz. of wheat flour into a thin paste, free from lumps, with a little water; make up to 2 pints, boil it till it froths, and add it to the liver of sulphur solution. This makes a valuable fungicide which leaves little unsightly spray residue on plants.

Powdery Mildew

Powdery mildew (*Oidium chrysanthemi*) shows as a white powdery growth covering the leaves. It usually appears only in plants growing in a sheltered position, either indoors or outdoors, where air does not circulate freely around them, and especially if the shoots are badly overcrowded.

Strong, well-grown plants in open borders are rarely attacked, but if the disease appears in calm, muggy weather regular dustings of flowers of sulphur will usually check it. The liver of sulphur wash (recommended for preventing attacks of rust) will also control mildew. In glasshouses as much ventilation and as little water as possible should be given to keep the atmosphere fresh and dry.

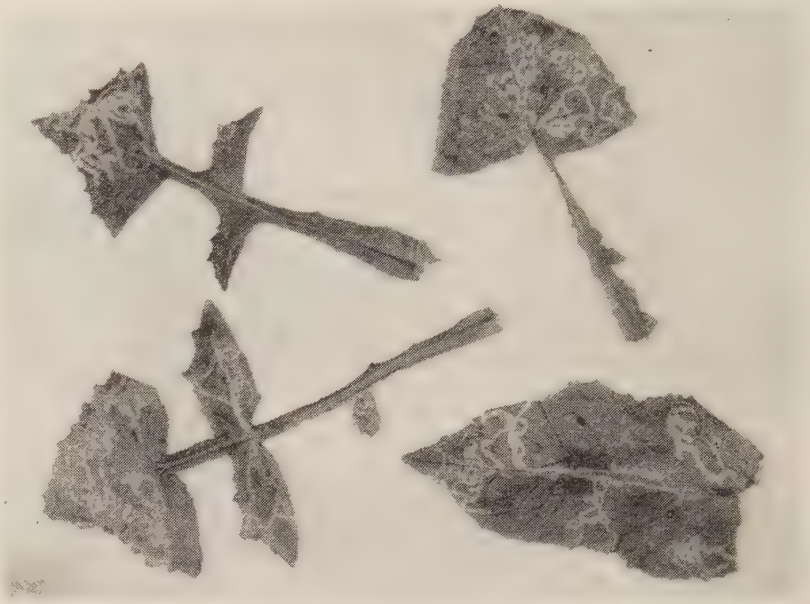
Spotted Wilt

The spotted wilt virus which attacks tomatoes and many other plants also causes a disease of chrysanthemums. Young plants attacked develop pale yellow areas in the leaves, followed by a browning of the surface, but if

older plants are affected they may show hardly any symptoms. Though the virus does not seem to weaken the chrysanthemum seriously, any plant which has unusual-looking leaves is best pulled up and burned, since it may serve as a centre from which other garden plants are infected with this disease.

Leaf-miner

Cineraria leaf-miner (*Phytomyza atricornis*) causes white, yellow, or brownish tunnels in the leaves of chrysanthemums and many other plants, including dahlias, sow thistles, and dandelions. In a very severe attack so many chrysanthemum leaves may be killed that the plants produce only small, late flowers. Infected weeds should be pulled up and burned, and larvae within the leaves of garden plants should be crushed with the fingers (a larva is usually located at the widest end of each tunnel). It is important to keep a sharp lookout for the pest early in the season, since there are several generations a year, and it increases rapidly if unchecked. A severe attack can be controlled by weekly spraying with nicotine solution, making sure that both upper and under surfaces of the leaves are wetted; but this should not become necessary if the measures suggested are adopted.



The cineraria leaf-miner, shown above tunnelling in sow thistle leaves, also attacks the chrysanthemum and dahlia.

Aphis

Chrysanthemum aphis (*Macrosiphoniella sanborni*) may be found in dense blackish colonies on chrysanthemums and many other garden plants, including the cineraria, sunflower, plum, and salpiglossis. This "green-fly" may cause serious damage to the young shoots and distortion of the flowers if unchecked. It can be kept under control by spraying with a nicotine spray or the "paranaph" mixture described on page 83 of the "Journal" of January, 1946. This should be done as soon as aphis are seen, since the pest multiples very rapidly in suitable weather.

Greenhouse White Fly

The greenhouse white fly (*Trialeurodes vaporariorum*) attacks chrysanthemums and a wide range of other plants growing in glasshouses, causing them to become unsightly because of a sticky material which the fly secretes. A natural parasite of the white fly has been introduced lately, and is reported to be controlling this pest. Fumigation with hydrocyanic acid gas is an alternative control measure for attacks of the fly on chrysanthemums under glass.

Earwigs

Earwigs (*Forficula auricularia*) may cause extensive injury to blooms, gnawing the petals and giving the flower a ragged look. The earwigs feed mainly at night and hide during the day among the petals or elsewhere. Many earwigs can be trapped in balls of crumpled newspaper put on the borders at night and burned the next morning, or in jars or plant-pots stuffed with straw and inverted on canes in the flower beds. In serious attacks a poison bait can be used with success; further details will be forwarded to anyone interested.

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Garden Work for August

DAHLIAS may be increased by cuttings, or by splitting up and replanting last year's roots, provided each root planted has at least one bud on it. The cutting method is preferred by many good growers. To get cuttings rooted and ready for planting in early November, roots should now be put in boxes, packed with soil, taken into a light place in a frame or glasshouse, and kept slightly moist. New shoots will soon appear. These should be cut off cleanly with a razor blade when 3in. long, either with a small piece of the old root attached or cut off just below a pair of leaves. Insert the cuttings 1in. deep in boxes or pots of light sandy soil, and put them in a frame or glasshouse for protection from frost. Shade them with newspaper and keep them damp for the first few days to prevent flagging until the cuttings root.

In cold districts bush roses should not be pruned until the end of August, or even early in September, to avoid damage by frost. The simplest method of pruning is to cut all last year's shoots back to within an inch or two of older wood and cut out weak pieces altogether. Climbing roses are pruned now by leaving the main framework of old wood and cutting back the side shoots. Rambler roses should have been pruned last autumn by cutting all branches which had flowered back to ground level.

If early-flowering chrysanthemums are to be increased from cuttings, these should be taken now as they appear. Full details of the procedure were given in last month's "Journal."

Gladiolus corms can be planted from now on to give a long succession of bloom. The ground should be dug really deeply beforehand and enriched with compost or animal manure and a liberal dressing of complete fertiliser to ensure good flowers. Diseased places on the corms should be cut off cleanly before planting. Plant corms 3in. deep in heavy soil and up to 4in. in lighter soil.

Where tulips have been planted, keep a sharp look out for small, twisted, and distorted shoots, often covered with a fine grey mould. These are the "primary infections" from which tulip fire disease is spread. If all such plants are dug out carefully, put in a bucket, carried away and burned at once, serious marking of the leaves and flowers of the remaining tulips later in the season will often be avoided.

In early districts hardy annuals can be sown outside from now on and the half-hardy bedding plants can be sown in boxes in frames for planting out later. There is no advantage, however, in sowing seeds of bedding plants too early, as they never fully recover from being starved in their boxes if they are not planted out as soon as they are ready. Flower seeds should never be sown in the open unless the soil is in a suitable condition—dry enough to walk on and work without it sticking to tools and footwear. If the soil is wet or muddy it is far better to wait until it dries before sowing seeds. Hardy annuals for sowing outdoors to give a long succession of bloom include candytuft, calendula, nasturtium, annual gaillardia, French and African marigold, cornflower, clarkia, annual chrysanthemum, *Phlox Drummondii*, sweet sultans, sweet alyssum, and love-in-the-mist. Among the seeds often sown in boxes for planting out later are varieties of *Salvia splendens*, petunia, portulaca, zinnia, verbena, aster, and salpiglossis, as well as many of the annuals listed.

When planting shrubs, herbaceous plants, roses, etc., the hole should always be large enough to allow the roots to be spread out fully. When the soil has been filled in the plant should be given a light shake to work it between the small roots; the soil should then be firmed by treading it with the foot. Firm planting always pays. Generally speaking, plants should be planted to about the same depth as they were before (as shown by the soil mark on the bark in the case of shrubs and roses). It is a mistake to put plants much deeper than they were in the nursery, and it may be disastrous in some cases—for instance with roses. If plants arrive from the nurseryman when the soil is too wet to plant them permanently, undo the bundle, separate the plants, put them in a small trench in an odd corner, and cover the roots with soil ("heeling in"). Any attempt to plant in wet ground will lead to the soil being churned into mud and prevent the plant from rooting properly.

GARDEN GOSSIP

HOW we welcomed the change to the south and the recent rain. Before then the country was absolutely parched with the grass crisping under one's feet. In the garden vegetables and flowers were wilting and dying. Unfortunately we hadn't sufficient water to ply a hose, and so I continued to endure unhappiness at seeing cherished plants gradually disappearing from the flower borders. Today I was delighted to find a fresh green shoot appearing on one newly-planted treasure which had hitherto looked absolutely withered. There is no more welcome sound than that of rain after drought, and I think the scent of parched earth when moisture falls is better than the rarest of perfumes.—**"Cloudy," Ashburton.**

I WANDERED past a lovely garden recently and stopped to drink in its beauty. A lady, busily working as she knelt by a bed absolutely aflame with colour, rose and said: "It is lovely, isn't it"? (Don't you like coming unexpectedly to a hedge or wall and looking over into an enchanting spot like that?) I liked her sincerity. She'd done a good job and it was a joy to everyone. Many people would have said, "Oh, yes, it's nice, but if only—" and spoilt it all. I don't think we should get into the habit of always decrying our own handiwork out of false modesty, do you?—**"Tiggetty Boo," Kati Kati.**

I AM very fond of flowers. I've been here two and a half years now and have had loads of flowers this summer, and there were also plenty of spring bulbs and flowering shrubs, although the latter had grown up to twenty feet and I had a great time cutting down and pruning rhododendrons and cherries, etc. Now I am busy planting sixty clumps of polyanthus and primroses, and those that are left over I am giving to neighbours who haven't got these particular shades. I am putting in a hundred anemones behind the polyanthus, also two dozen tulips between some of the anemones. Later I will grow ixias and sparaxis so as to have plenty of blooms till the summer flowers start to come.—**"Garden Lover," Eltham.**

THE former owner of our farm apparently was not a lover of Nature. There was not a tree round the house, not even a shrub or flower. It is all so desolate and neglected that I am certain no bulbs will come up as a pleasant surprise. But today I am thrilled, for we now own a beautiful patch of native bush containing rimus, kauris, totaras, and the loveliest ferns. So I am dreaming of making a garden and having velvety lawns and graceful trees and some of our native ferns.—**"Lonely Londoner," North Auckland.**

I ENJOYED reading Elsie K. Morton's "Gardening's Such Fun." Her mistakes as an amateur gardener were amusing, but we make the same mistakes, too, and sometimes the slugs get all our choice petunias and the puppy scratches up our seedlings, but the only thing to do is to have another try.—**"Susan," North Auckland.**

"O to be in England. . ."

71 Stockbridge Road,
Winchester,
Hants.,
England.

Dear Mary,

Since I last wrote I have been almost overwhelmed with New Zealand penfriends—indeed, I have found some difficulty in replying to them all. The warm friendship which pervades all the letters has touched me deeply. I thank them for the lovely things they said about Britain's fortitude, but I do hope they realise how much we appreciate all New Zealand has done for us: without your voluntary self-rationing we would have fared very badly.

The blow of new ration changes was softened for me today when visiting a young friend in a sanitorium. There are some Dutch children in the clinic and we watched three of these boys playing on the lawn when an English nurse walked across. The two bigger boys ran as fast as their rickety legs could carry them and clung to her hands—the small boy only managed to grab her apron. The nurse gently released one hand and drew the small lad into the circle of her arm, and so the happy little group went into tea. What an example of international understanding—would that all nations could copy it for the world's good.

I've been for my favourite walk—to visit the lovely old house where Jane Austen lived. It is very charming and stands flush with the pavement, but facing it is a herbaceous garden which is a riot of colour throughout the flowering season. It is edged with a fine grass verge and flanked with the tall grey walls of the Cathedral Close. It can't have altered since Jane's day. A gracious gesture is shown to visitors by the present owner of the house: there is always displayed in the window a beautifully arranged bouquet of flowers or leaves—masterpieces of arrangement, many of which I have tried to copy in my own home, though not very successfully, I'm afraid.

Although the weather is still wintry, spring can't be far away. Gardens look very gay with snowdrops and crocuses blooming and, in sheltered spots, even a few primroses braving the elements, but I think all in Europe are wishing for this year to hurry past and for an excellent harvest to ease the food situation on the Continent.

With all good wishes,

Iris M. Jones.

Nothing makes the earth seem so spacious as to have friends at a distance: they make the latitudes and longtitudes. —Thoreau.

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BATH NIGHT AT BROWNS'

ON one occasion after my youngest child had been helping in the garden and his bath water was very discoloured in consequence, an elder brother remarked that baby's bath was like the Black Sea. This apparently put ideas into his head, for when I returned from tucking the baby up into bed, I found the other two boys in the bath manoeuvring their toy battleships in bright red water. They had decided to sail their navy in the Red Sea, and as a bottle of cochineal had merely turned the water pink, a large bottle of red ink had been tipped in, too. Clean water and plenty of soap removed the rosy hue from their skins, but alas! their snowy hair was dyed a beautiful pink and remained so for some time afterwards! There have been numerous other hectic bath nights as well. Once the power failed and the boys thought it such a waste of soap as they couldn't see the dirty spots and had to wash all over!—**"Moon Maiden," Hawera.**

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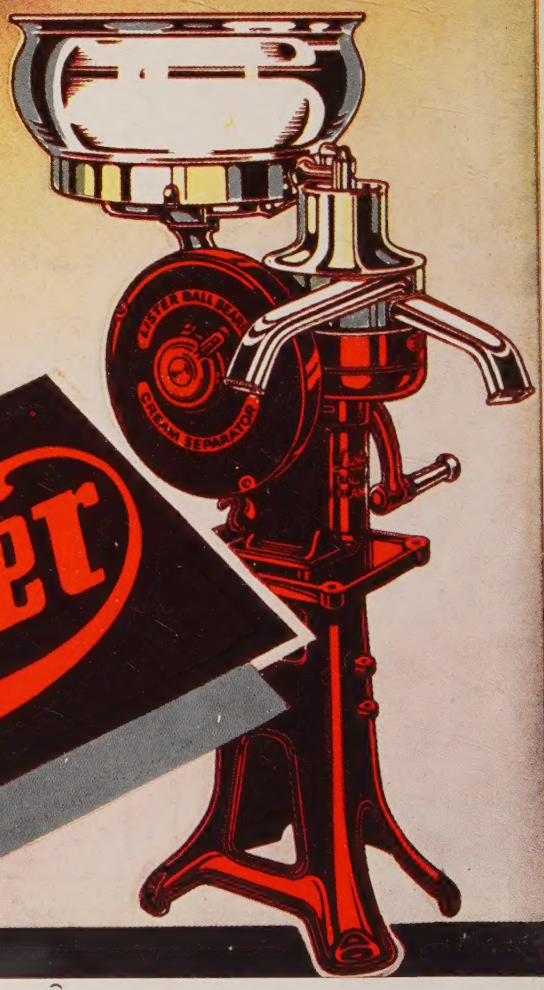

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